DEFENDER CLASS OPERATOR'S HANDBOOK

U.S. Department of Homeland Security

United States Coast Guard

COMDTINST M16114.37A

U.S. Department of Homeland Security

United States Coast Guard

Commandant
United States Coast Guard

2100 Second Street SW
Washington, DC 20593-0001
Staff Symbol: G-OCS
Phone: (202) 267-1313

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Subj: DEFENDER CLASS OPERATOR'S HANDBOOK

1. PURPOSE. This Manual provides technical orientation, performance characteristics, and basic operating procedures, and standard boat outfitting for Defender Class response boats. The Defender Class is comprised of the 25' Response Boat-Homeland Security (RB-HS) and 25' Response Boat-Small (RB-S).

2. ACTION. Area and district commanders, commanders of maintenance and logistics commands, commanding officers of headquarters units, assistant commandants for directorates, Chief Counsel, and special staff offices at Headquarters shall ensure adherence to the contents of this Manual at all units which operate and/or maintain Defender Class boats. All design or structural alterations are prohibited unless specifically authorized by Commandant (G-SEN). Internet release authorized.

3. DIRECTIVES AFFECTED. *25' Response Boat - Homeland Security (RB-HS) Operator's Handbook*, COMDTINST M16114.37, is cancelled.

4. DISCUSSION. This Manual contains the information necessary to safely and efficiently operate Defender Class boats. The operational capabilities, limitations, and emergency procedures are clearly stipulated. The fittings, outfit list, and physical characteristics of the boats are pictured and described in detail. This Manual is directive in nature and applies to all Defender Class crews, and operational and supervisory commands.

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5. PROCEDURE. District, operational, and unit commanders for all units with Defender Class boats shall ensure the procedures and limitations detailed within this Manual are followed. Forward any comments, corrections, recommendations and questions regarding this handbook to the Defender Class Facility Manager in accordance with Section 1.C. of this Manual. Design and structural change requests shall be submitted as outlined in the *Naval Engineering Manual*, COMDTINST M9000.6 (series).

6. ENVIRONMENTAL ASPECT AND IMPACT CONSIDERATIONS. Environmental considerations were examined in the development of this directive and have been determined to be not applicable.

7. FORMS AVAILABILITY. None.

R. R. KELLY
Acting Assistant Commandant For Operations

RECORD OF CHANGES

CHANGE NUMBER	DATE OF CHANGE	DATE ENTERED	ENTERED BY

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The Office of Boat Forces (G-OCS) gratefully acknowledges the assistance of the following personnel in the development and publication of this manual:

Mr.	Orlando Arenas	CDI Marine
Ms.	Jennie Bogden	G-ACS
Mr.	Byron Braun	G-LPL
Mr.	Tom Brust	G-ACS
LCDR	Greg Carter	G-OCS
CWO	John Carter	ELC
Mr.	Doug Clements	Safeboats International
LCDR	Rich Condit	G-OCS
	Crew	Station Curtis Bay, MD
	Crew	Station Fort Pierce, FL
	Crew	Station Atlantic City, NJ
Mr.	Jeff Curtis	ELC
Mrs.	Linda Dearing	G-ACS
Mr.	Joe Fiorillo	EDO Professional Services Division
LT	Glenn Galman	G-OPD
BM1	Rob Goley	Station LA/LB, CA
CAPT	Dana Goward	G-OCS
LT	Tim Greten	G-OCS
MKCM	Albert Hall	MLC Atlantic
Mr.	Bill Hansen	Safeboats International
CDR	Harry Haynes	G-OCS
LCDR	Jim Healy	RB-S PRO
Mr.	John Howell	Howell Marine
Ms.	Terri Jendrossek	G-ACS
LCDR	Dan Johnson	ELC
BMCS	William Johnson	CPOA
LT	Greg Lambrecht	G-SCE
CAPT	James Maes	G-OCS
CWO	Ken McDaniel	G-OPD
LT	Jim Novotny	G-SEN
LT	Jeff Peterson	G-SCE
Mr.	Scott Peterson	Safeboats International
MK1	Aaron Sala	Station Curtis Bay, MD
BM1	Doug Schubert	Station Fort Lauderdale, FL
Mr.	Dave Shepard	G-OCS
BMCS	Rob Snyder	D1
Ms.	Val Veach	G-ACS
CWO	Keith West	D9
LT	John Whittemore	ELC
Mr.	Gary Wilhelm	Safeboats International

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Chapter 1
Introduction

Introduction

This handbook contains specific information necessary for the safe and efficient operation of Defender Class boats, which includes the 25' Response Boat – Homeland Security (RB-HS) and 25' Response Boat – Small (RB-S). This handbook defines the operational capabilities, limitations, and emergency procedures, describes the fittings, outfit lists, and physical characteristics of each boat.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Warnings, Cautions, and Notes	1-3
B	Facility Manager	1-5
C	Changes	1-7
D	Action	1-9

Section A. Warnings, Cautions, and Notes

Introduction

The following definitions apply to Warnings, Cautions, and Notes found throughout the handbook.

A.1. Warning

WARNING

Operating procedures or techniques that must be carefully followed to avoid personal injury or loss of life.

A.2. Caution

CAUTION !

Operating procedures or techniques that must be carefully followed to avoid equipment damage.

A.3. Note

NOTE

An operating procedure or technique essential to emphasize.

Section B. Facility Manager

Introduction

Commandant (G-OCS-2) is the facility manager for Defender Class boats. The Defender Class is comprised of standard boats as defined in the *Boat Management Manual*, COMDTINST M16114.4 (series); and the *Naval Engineering Manual*, COMDTINST M9000.6 (series).

Commandant (G-AWP) is the project manager for Defender Class boats.

Section C. Changes

Introduction

Commandant (G-OCS-2) promulgates this handbook and its changes. Submit recommendations for changes to G-OCS-2 via standard memo or electronic mail. For more information, contact G-OCS-2, Defender Class Facility Manager.

The address for G-OCS-2 is:

Commandant (G-OCS-2)
U.S. Coast Guard Headquarters
2100 Second Street, SW
Washington, DC 20593-0001

Attn: Defender Class Facility Manager

C.1. Engineering Changes

All engineering changes (ECs) issued since the RB-HS and RB-S have been in service are provided in *Appendix B*. ECs issued after the date of this revision supersede information in this handbook where applicable.

Section D. Action

Introduction

Operating and supervisory commands and boat crews will comply with the procedures and limitations specified in this publication and any duly issued changes.

D.1. Configuration Control

Configuration control for the Defender Class is critical for standardization of equipment and safety of operations.

NOTE

To maintain fleet-wide standardization, unit commanders shall not change or vary the type or location of equipment carried except where noted. Design or structural alterations are prohibited unless specifically authorized by the USCG Engineering Logistics Center (ELC) and are in accordance with the *Naval Engineering Manual*, COMDTINST M9000.6 (series).

NOTE

Prototype testing of Defender Class configuration changes may only be carried out with the specific authorization of the USCG ELC.

Chapter 2
Boat Characteristics

Introduction

This chapter describes standard features for Defender Class boats. The general location of the major hull and system components is presented in this chapter. Detailed information about hull and system components is provided in *Chapter 3*, *Boat Systems*.

NOTE

All illustrations and photographs in this operator's handbook are for familiarization only. The location of hull fittings and system components in these illustrations may not accurately reflect proper placement and installation on all hulls.

NOTE

Where differences exist between the RB-HS and the RB-S, they are specifically identified in the text by hull designation.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	General Description	2-3
B	Compartments	2-9
C	Main Deck Equipment	2-21
D	Main Deck Stowage	2-33

Section A. General Description

A.1. Design	Each Defender Class boat has a deep-V, rigid mono-hull with a stabilizing closed cell polyethylene foam collar.
A.1.a. Hull and Deck	The hull and deck structures are constructed of marine grade aluminum and are welded using Metal Inert Gas (MIG) or Tungsten Inert Gas (TIG) welding techniques as required.
A.1.b. Walking Surfaces	Non-skid material is installed on the deck areas except that a 1-inch "no non-skid" area is provided around fittings, between non-skid pads, and around deck drains.
A.1.c. Cabin	The cabin is constructed of 5052 marine grade aluminum and is welded to the hull. The cabin provides seating for the four crewmembers. All boat systems operating controls are contained in the cabin. A small cuddy cabin, forward of the main cabin area, provides access to electronics, the heater, and the forward deck area. A hinged radar pod and the VHF antennas atop the cabin can be lowered for transport on a C-130 aircraft.
A.1.d. Collar	The collar is manufactured from closed cell polyethylene foam with an ultraviolet (UV) stable polyurethane coating. The collar is bolted directly to the outside of the hull and cannot lose buoyancy or absorb water.
A.1.e. Bow Post and Tow Post	An integral bow post and tow post are welded to the hull structure. Both posts may be used as gun mounting points.
A.2. Manufacturer	Defender Class boats are designed and manufactured by: SAFE™ Boats International 8800 SW Barney White Road Port Orchard, WA 98367

A.3. Missions

Defender Class boats are intended to operate from Coast Guard stations, Marine Safety Offices (MSOs), and Marine Safety and Security Teams (MSSTs) with the following missions:

- Defense Operations (DO)
- Port Safety and Security (PSS)
- Recreational Boating Safety (RBS)
- Marine Environmental Protection (MEP)
- Enforcement of Laws and Treaties (ELT)
- Marine Safety and Security (MSS)
- Search and Rescue (SAR)

A.4. Boat Specifications

The following provides a list of all physical and operational characteristics of Defender Class boats.

A.4.a. Physical Characteristics

Design Length of Hull (RB-S measurement includes bow cover)	25' (7.6 meters) (RB-HS) 25' 2½" (7.7 meters) (RB-S)
Length Overall (bow to lowered taffrail)	29' 4" (8.9 meters) (RB-HS) 29' 6½" (9.0 meters) (RB-S)
Length at Waterline	22' 6" (6.8 meters) (RB-HS) 22' 8½" (6.9 meters) (RB-S)
Beam Overall	8' 6" including collar (2.6 meters)
Operational Draft (DIW with engines vertical)	39" (.98 meters)
Highest Fixed Point Above Waterline	8' 9" (2.7 meters)
Highest Point When On Trailer (anchor light)	11' 1½" (3.4 meters)
Highest Point When On Trailer (anchor mast down)	8' 10" (2.7 meters)
Crew Capacity (cabin seats)	4
Passenger Capacity (sitting on aft boxes and gunwales)	6
Seating Total	10
Fuel Tank Capacity	125 gallons (RB-HS) 105 gallons (RB-S)
Propulsion Machinery	Twin Honda 225-HP, 4-stroke outboards
Propellers	14x19 Mercury Offshore or Vensura Series

NOTE

Defender Class boats can operate with a minimum complement of two, a coxswain and crewmember. Crew and passenger weights shall be 180 pounds per person when calculating weights for other loading configurations.

Boat Weight (fully outfitted, no crew)	7400
Boat Maximum Weight (fully outfitted, four crew, six passengers)	9200
Weight (fully outfit, fuel, trailer, no crew)	9450

A.4.b. Operational Characteristics

Maximum Speed	46 knots at 6000 RPM
Cruise Speed	35 knots at 4800 RPM
Maximum Range at Cruise Speed	175 NM (RB-HS)
Maximum Range at Cruise Speed	150 NM (RB-S)
Maximum Operating Winds	25 knots
Maximum Operating Seas	6' (no surf)
Maximum Towing Capacity	10 displacement tons
Maximum Operating Distance Offshore	10 NM
Outside Air Temperature	0 to 105 °F
Outside Water Temperature	28 to 95 °F
Operation in Ice	None

A.5. Hull Reference Points

The following reference points on Defender Class boats are frequently used (**Figure 2-1**):

- Watertight bulkhead 7½
- Watertight bulkhead 13½
- Watertight bulkhead 16

Frames are numbered aft to forward.

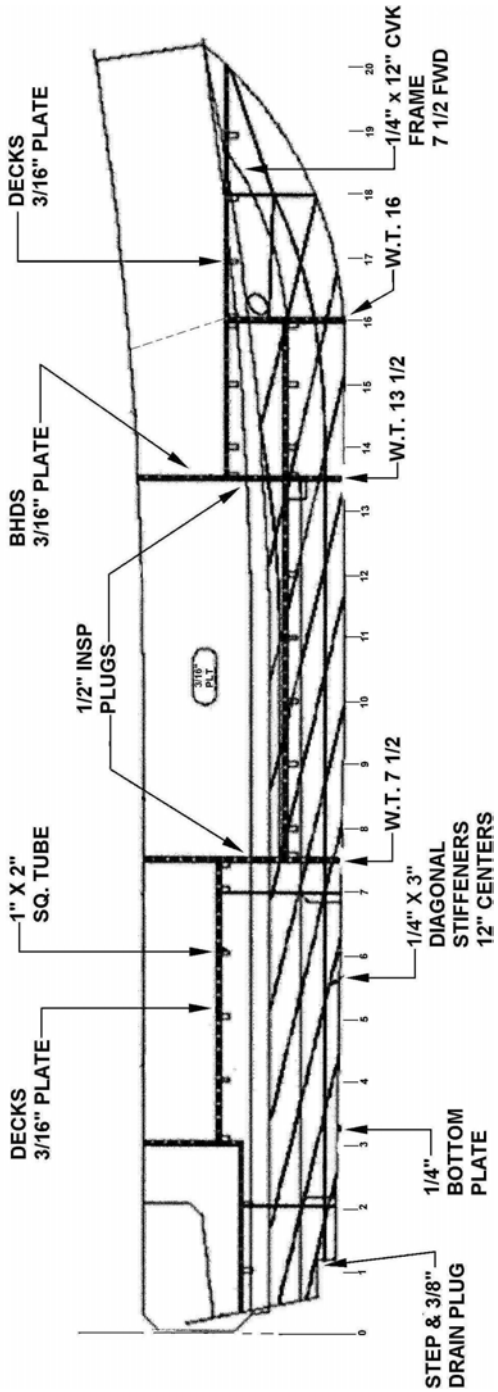

Figure 2-1
Defender Class Boat Hull Construction

Section B. Compartments

Introduction

The hull of Defender Class boats (**Figure 2-2, Figure 2-3,** and **Figure 2-4**) is comprised of a single pressure-tested, airtight, welded compartment. A fuel tank (125 gallons, RB-HS and 105 gallons, RB-S), fabricated from ¼-inch 5086 aluminum and supported by rubber isolation mounts, is part of the hull's structure.

B.1. Anchor/ Ammunition Locker

An anchor locker, with fabricated door (**Figure 2-5**), anchor tie-downs, and drain, is located at the bow, forward of the bitt. The locker has drain holes that empty onto the foredeck and out through the shell discharge tubes. Storage shelves are built into the locker door to accommodate four boxes of ammunition.

B.2. Cabin

The full width cabin (**Figure 2-6**) has seating for four crew with additional seating in the cuddy cabin. The RB-HS has two pneumatic suspension seats forward and two bolster seats aft. The RB-S has four pneumatic suspension seats installed. Port and starboard sliding glass windows allow for air circulation and overhead tinted spotter windows allow for greater visibility. A hinged weather-tight door is built into the aft bulkhead. Two sliding doors are located on the port and starboard sides of the main cabin. Welded handrails provide a minimum of two handholds for every seated crewmember. An overhead hinged instrument panel (OHIP) holds secondary "Contura" switches for navigation and deck lighting. Two 12-volt fans are mounted on the OHIP.

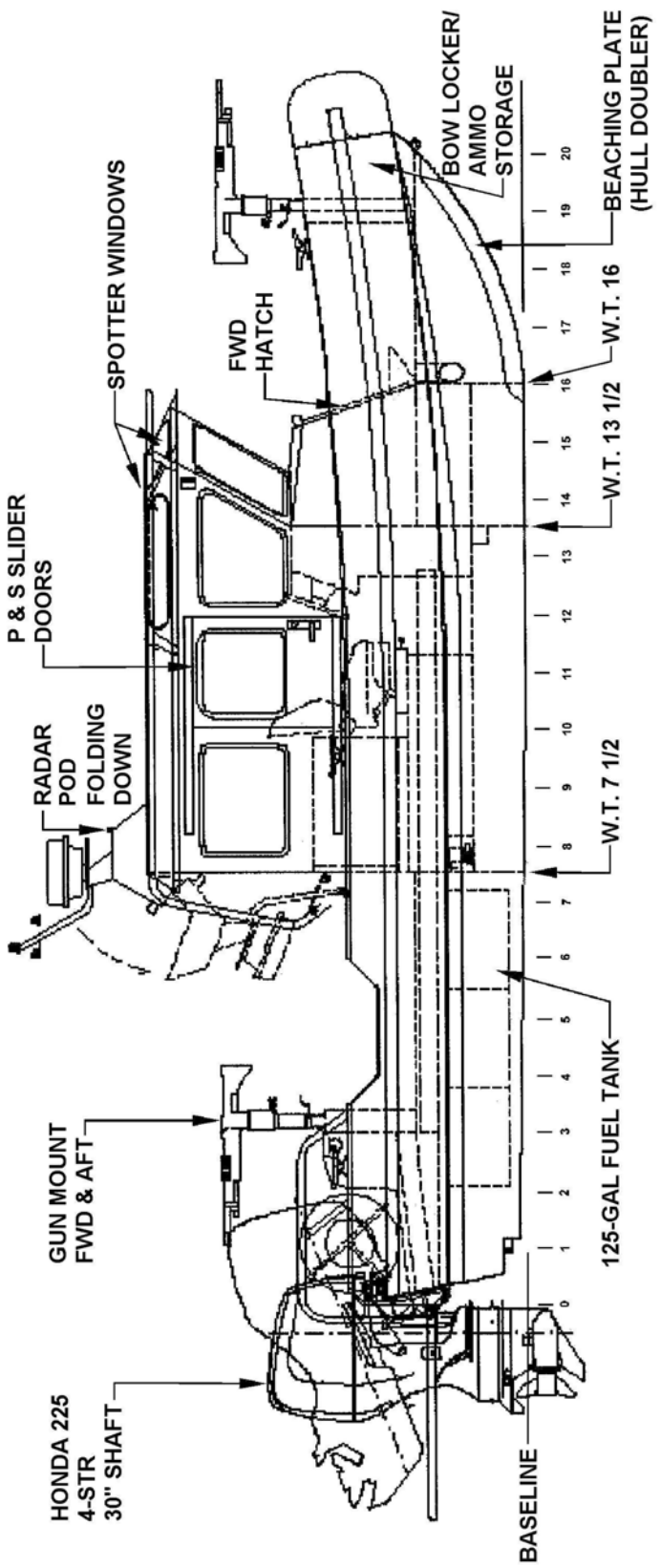

Figure 2-2
Outboard Profile (RB-HS)

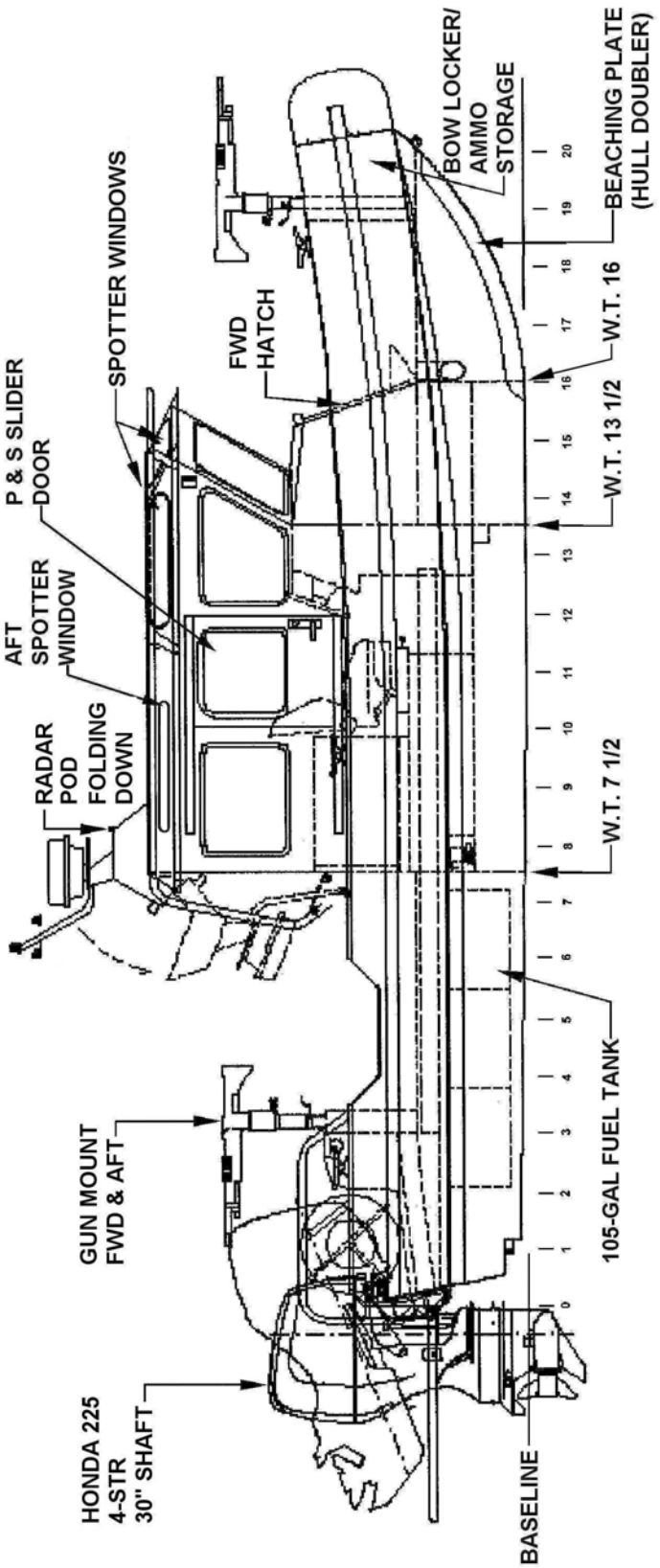

Figure 2-3
Outboard Profile (RB-S)

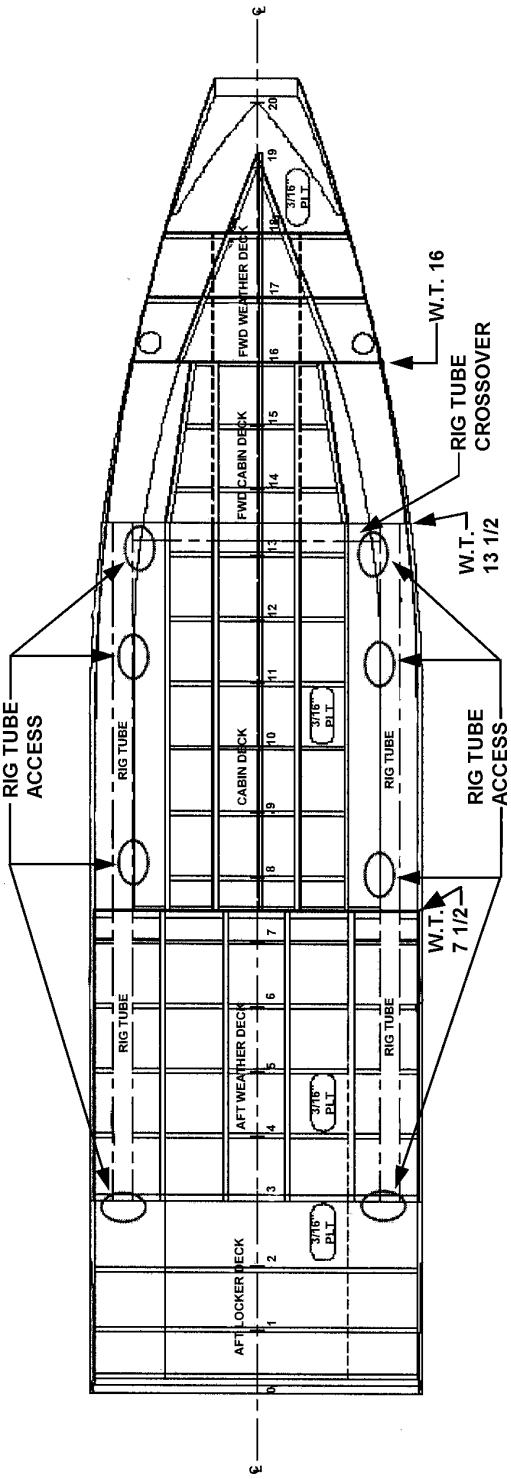

Figure 2-4
Inboard Profile

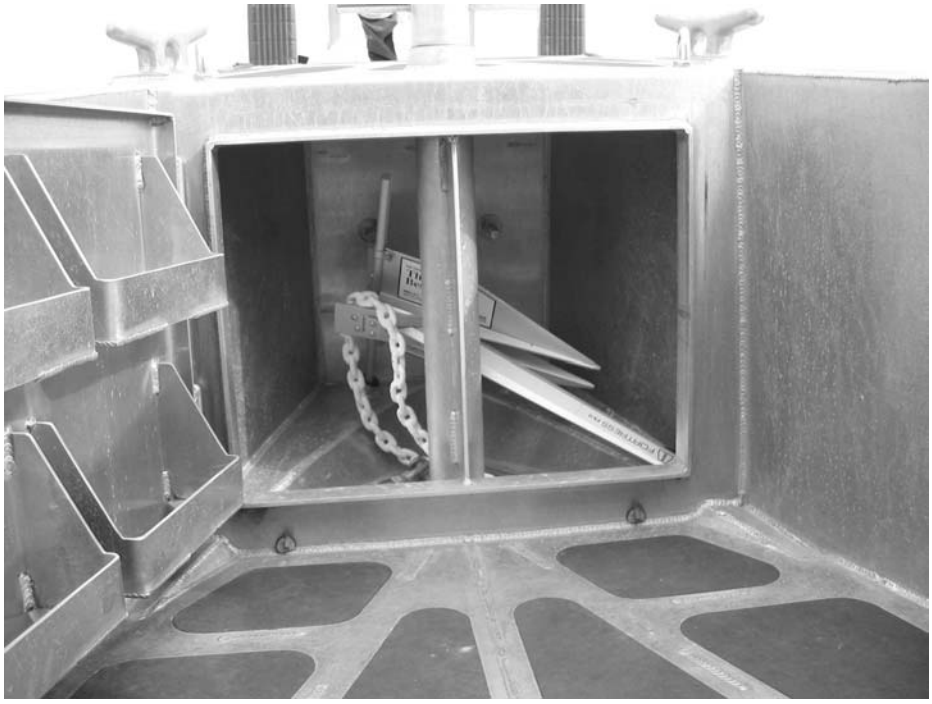

Figure 2-5
Anchor/Ammunition Locker

Figure 2-6
Cabin (RB-HS)

B.2.a. Windows

The RB-HS cabin has 12 windows and the RB-S cabin has 14 windows.

B.2.a.1. Forward Facing Windows

The two forward facing windows incorporate windshield wipers (**Figure 2-7**).

Figure 2-7
Forward Cabin Window with Windshield Wiper

B.2.a.2. Sliding Door Windows

Two windows (port and starboard) (**Figure 2-8**) are built into the sliding doors abeam of the helm chairs. The doors lock in the *open* position using an internal auto lock and slide mechanism that latches automatically when closed.

Figure 2-8
Sliding Cabin Door

B.2.a.3. Combination Windows	Two combination (fixed/opening) windows are aft of the sliding doors (**Figure 2-9** (RB-HS)).
B.2.a.4. Aft Bulkhead Windows	Two aft facing windows (port and starboard) are on the aft bulkhead (**Figure 2-9** (RB-HS), **Figure 2-10** (RB-S)).
B.2.a.5. Weather-Tight Door Window	An aft facing window is built into the weather-tight door in the aft bulkhead (**Figure 2-9** (RB-HS), **Figure 2-10** (RB-S)).

Figure 2-9
Aft Cabin Windows and Weather-Tight Door (RB-HS)

Figure 2-10
Aft Cabin Windows and Weather-Tight Door (RB-S)

B.2.a.6. Tinted Spotter Windows

Four tinted spotter windows are built into the overhead on the RB-HS (**Figure 2-11**).

The RB-S has six tinted spotter windows on the cabin roof:

- Two forward port and starboard of centerline (one port and one starboard).
- Two port side.
- Two starboard side.

Figure 2-11
Spotter Windows (RB-HS)

CAUTION !

The weather-tight door in the forward bulkhead of the cuddy cabin shall be secured after each use to prevent water intrusion.

B.3. Cuddy Cabin

A weather-tight door is located in the forward bulkhead of the cuddy cabin (**Figure 2-12**) leading to the foredeck. A bench seat is provided on the starboard side. The Webasto® diesel-burning, forced air heater for cabin and window defrosting is located on the port side of the cuddy cabin behind an aluminum access cover. A B-1 fire extinguisher is mounted on the protective cover. On the RB-HS, the diesel fuel tank for the heater is located aft of the cabin on the weather deck, port side. On the RB-S, the diesel fuel tank for the heater is located under the hinged cover, starboard aft locker.

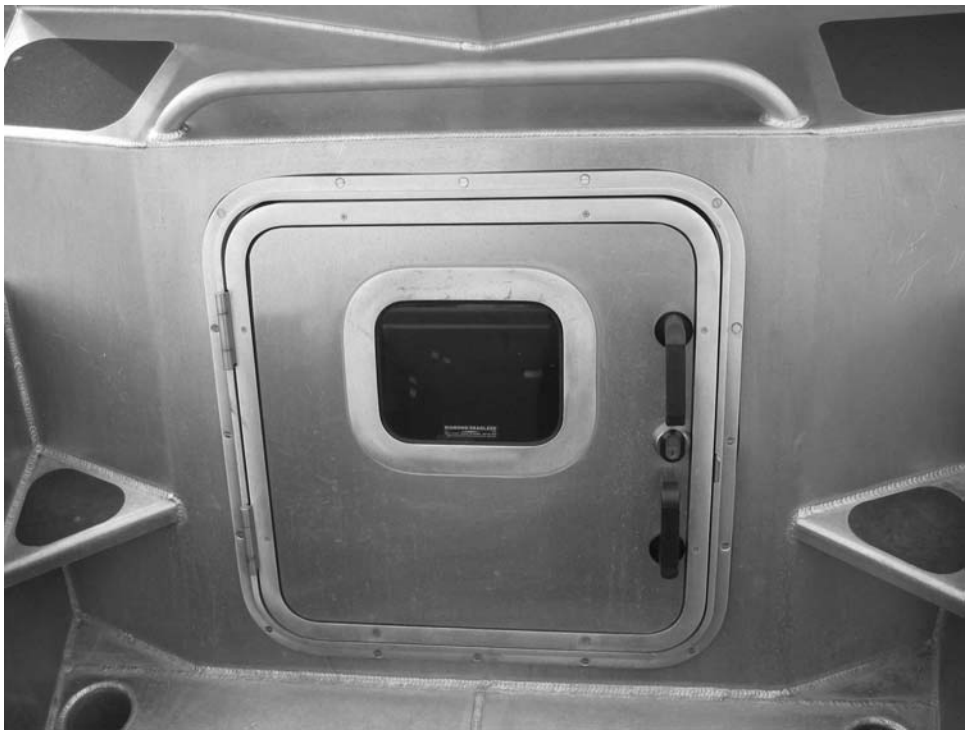

Figure 2-12
Cuddy Cabin

B.4. Port and Starboard Lockers

Port and starboard lockers are located astern of the weather deck. The port locker contains access to the fuel management system that includes the tank information plate, fuel filters, fuel pickup, vent tubing, primer bulbs, and Wema™ fuel-sending unit. A portable B-1 fire extinguisher is also mounted in the starboard locker. The starboard locker accesses the rig tube for the outboard engines and houses the diesel fuel tank for the heater (RB-S only).

B.5. Electric Cabin Dewatering Pump

The electric cabin dewatering pump on the RB-HS is located inside the cabin on the cabin floor, aft bulkhead on the centerline under the cabin step.

On the RB-S, an electric cabin dewatering pump having the identical performance characteristics as that of the RB-HS is located inside the cabin, starboard side aft, under the starboard aft passenger seat (**Figure 2-13**).

The pump is rated at 1100 gallons per hour and has a built-in float switch for automatic operation. The pump will turn *on* when the water level reaches 2⅛ inches and *off* when no load is sensed by the pump's impeller. The discharge for the electric cabin dewatering pump is located on the aft, starboard exterior cabin bulkhead, above the deck edge walkway. The pump requires 12 VDC for operation and draws 3.3 amps at 12 volts. The boat is outfitted with a portable, manual bilge pump rated at 10 strokes per gallon and 6 gallons per minute.

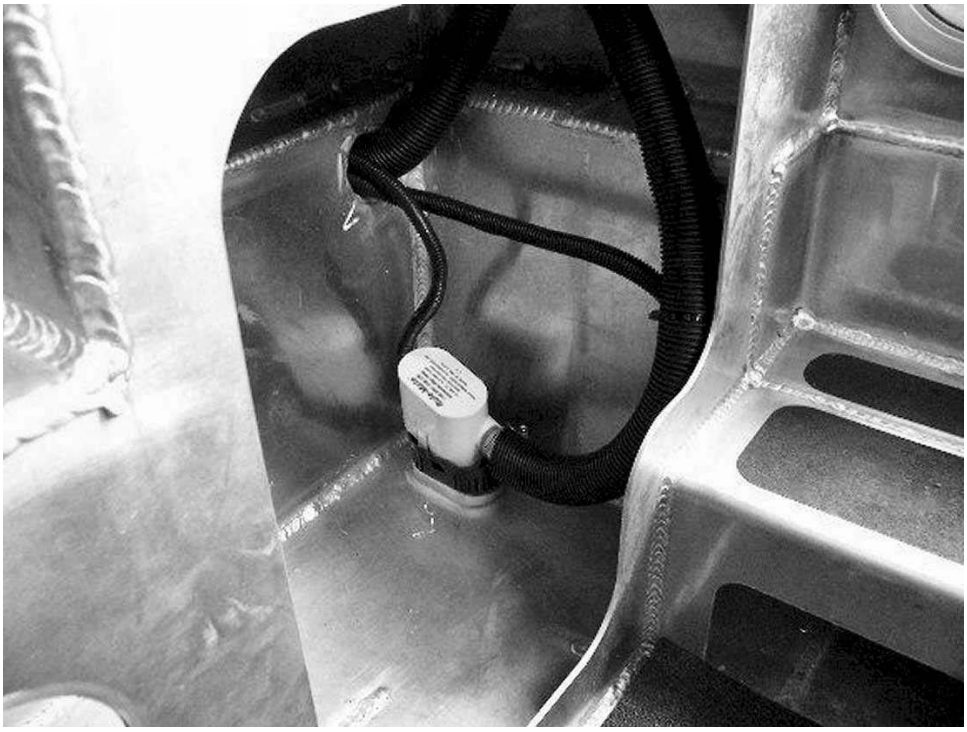

Figure 2-13
Electric Cabin Dewatering Pump (RB-S)

Section C. Main Deck Equipment

C.1. Bow Eye

A stainless steel bow eye (**Figure 2-14**) is through-bolted to the stem below the collar and above the waterline, and is secured with backing plate and two ½-inch stainless steel nuts.

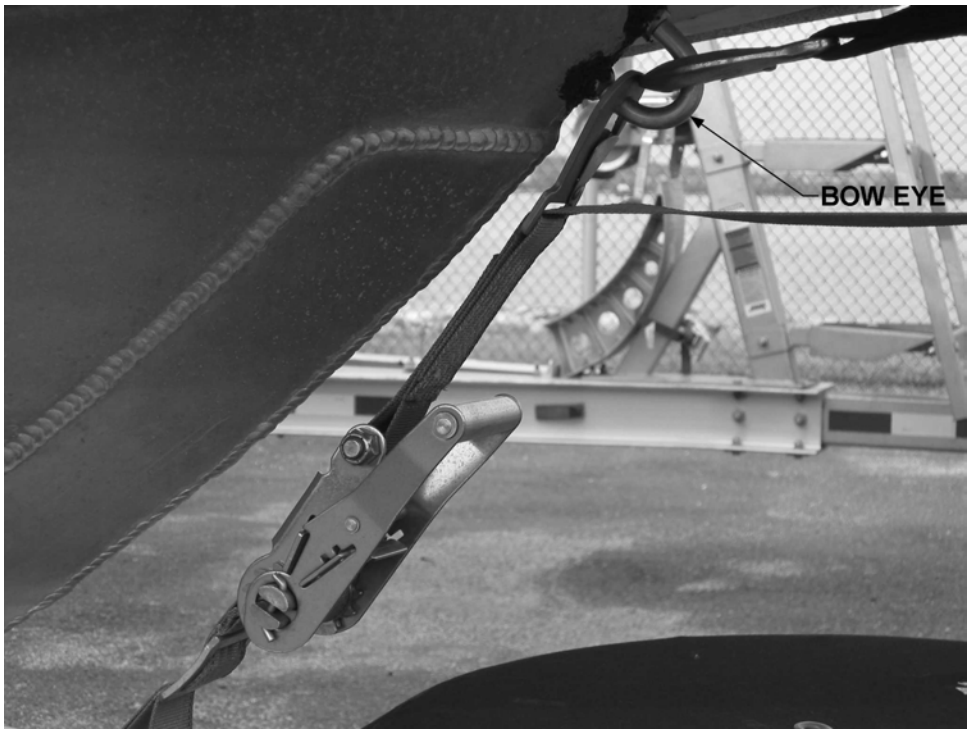

Figure 2-14
Bow Eye

C.2. Standard Cleats

Six 10-inch aluminum standard cleats (**Figure 2-15**) located port, starboard, forward, aft, and amidship are fully welded to the gunwhale.

C.3. Tow Bitts

Two tow bitts with stainless steel Norman (cross) pins (**Figure 2-16** (RB-HS) and **Figure 2-17** (RB-S)) are located forward and aft on centerline. Each bitt accommodates the MK16 light machine gun stand. The aft tow bitt on the RB-S incorporates an additional handhold welded between the vertical tow bitt member and the equipment locker.

Figure 2-15
Standard Cleat

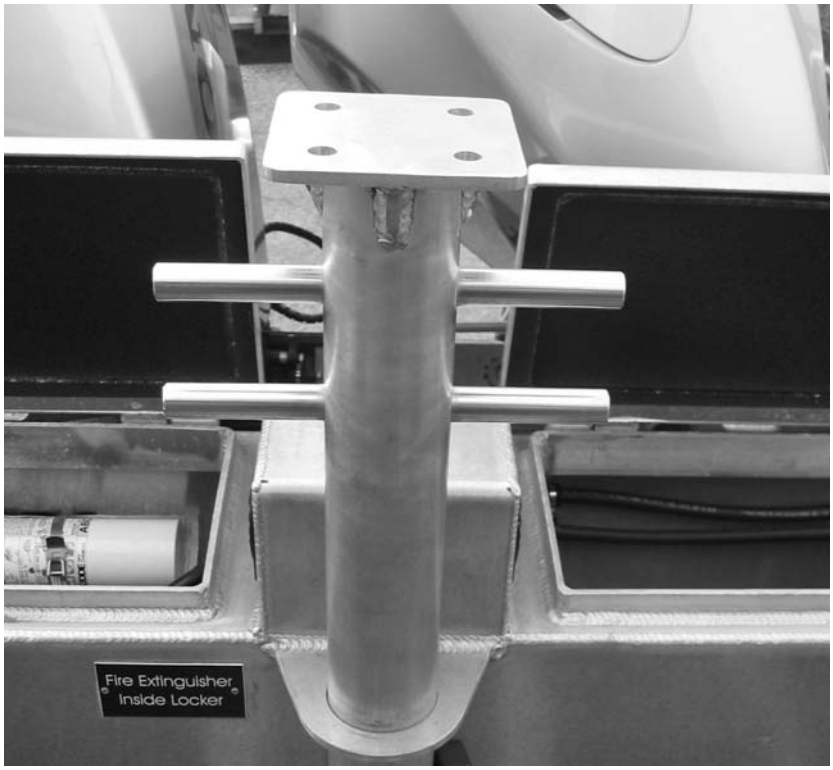

Figure 2-16
Aft Tow Bitt (RB-HS)

Figure 2-17
Aft Tow Bitt (RB-S)

C.4. Handrails

A single horizontal handrail (**Figure 2-18**) runs continuously port and starboard and around the front of the cabin. Two additional port and starboard handrails lead aft then vertically midway down the transom. A single horizontal handrail runs the width of the radar pod. Two vertical handrails are located port and starboard on the aft exterior cabin bulkhead (**Figure 2-18**).

Figure 2-18
Handrails

C.5. Transom Eyes

Two stainless steel transom eyes (**Figure 2-19**), suitable for securing the RB-HS to the trailer, are located port and starboard on the transom, above the waterline.

Figure 2-19
Transom Eye

C.6. Non-Skid

The exterior decks are covered with non-skid pads. All non-skid edges are treated with edge seal. A 1-inch clearance is provided between the non-skid pads and deck fixtures, accesses, and openings.

C.7. Deck Lighting

Both the RB-HS and RB-S superstructures have four dimmable light emitting diode (LED) deck lights (**Figure 2-20**) mounted low on the port and starboard sides of the cabin exterior, to allow safe crew movements during night operations. The RB-S incorporates four additional LEDs installed for deck lighting. Two LEDs provide illumination for the foredeck and are mounted port and starboard on the exterior bulkhead of the cuddy cabin hatch (**Figure 2-21**). Two are mounted on the exterior aft cabin bulkhead port and starboard of the cabin door (**Figure 2-22**).

Controls for all deck lights are located on the OHIP.

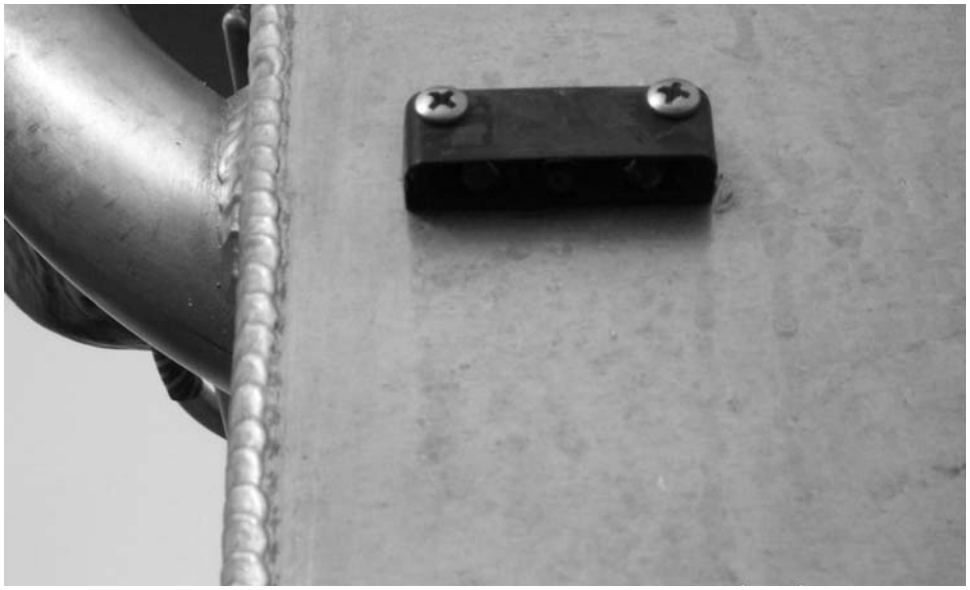

Figure 2-20
Deck Lighting

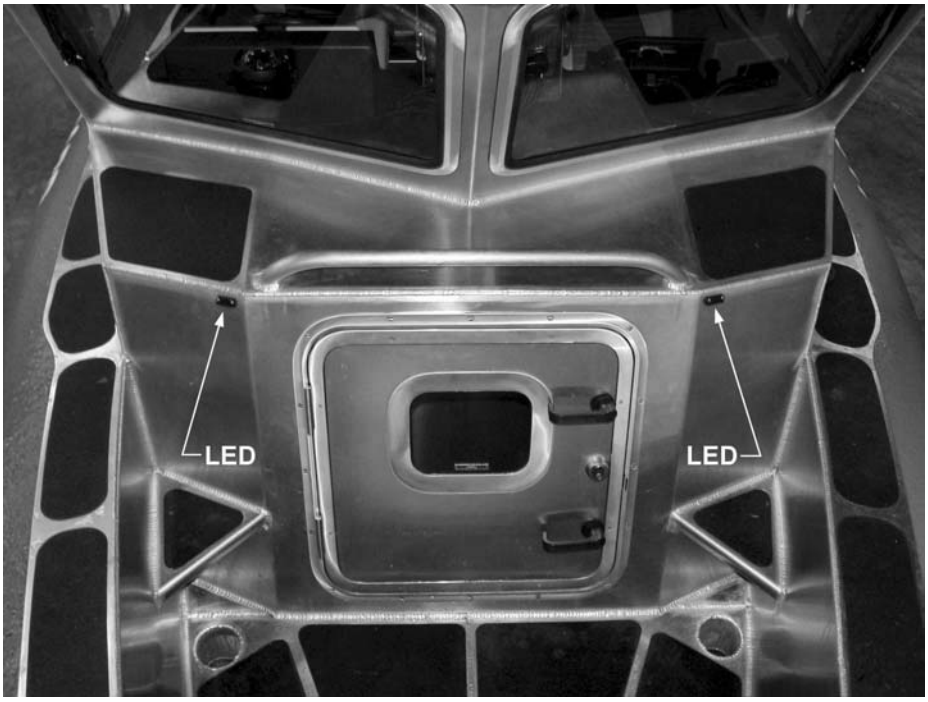

Figure 2-21
Foredeck LEDs (RB-S)

Figure 2-22
Aft Deck LEDs (RB-S)

C.8. Lifting Eyes Defender Class boats have four lifting eyes (**Figure 2-23**). Two are located above the anchor locker and two are located in the forward bulkhead of the aft lockers. Each eye is rated at 9500 pounds. Special slings, available from SAFE™ Boats International, should be used to lift the boat.

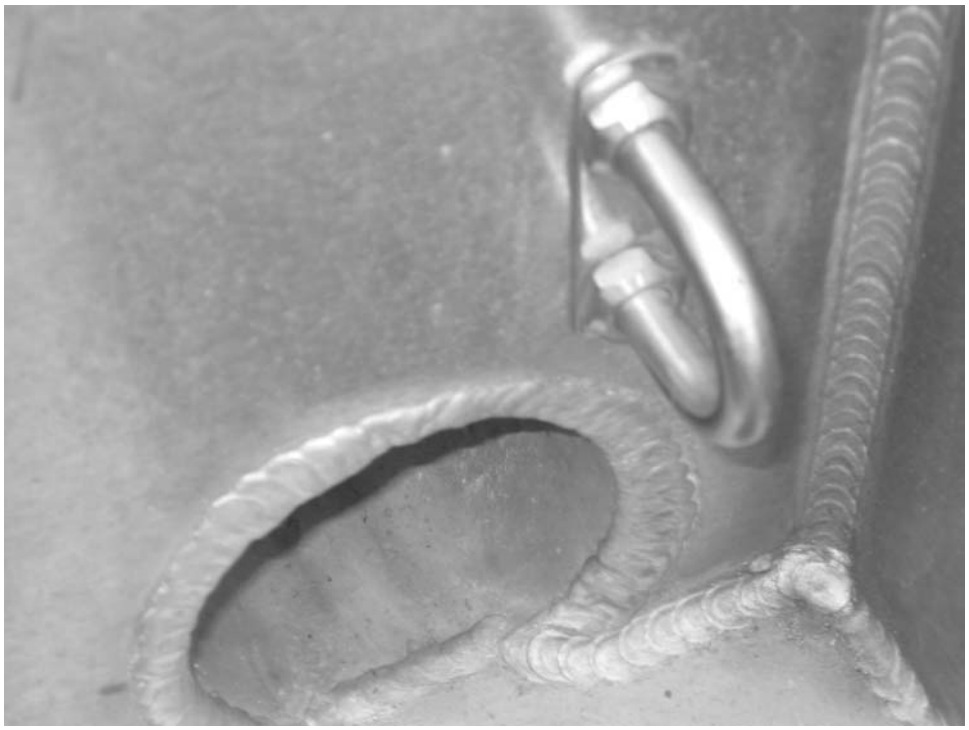

Figure 2-23
Lifting Eye

C.9. Navigation Lights

Port and starboard navigation lights (**Figure 2-24**) are mounted on the cabin above the forward windows. Incandescent lamps are installed in the RB-HS navigation lights and LEDs in the RB-S.

Figure 2-24
Navigation Light (Port)

C.10. Ring Buoy and Strobe Light

A 24-inch ring buoy and strobe light (**Figure 2-25**) are mounted at the stern on the port side.

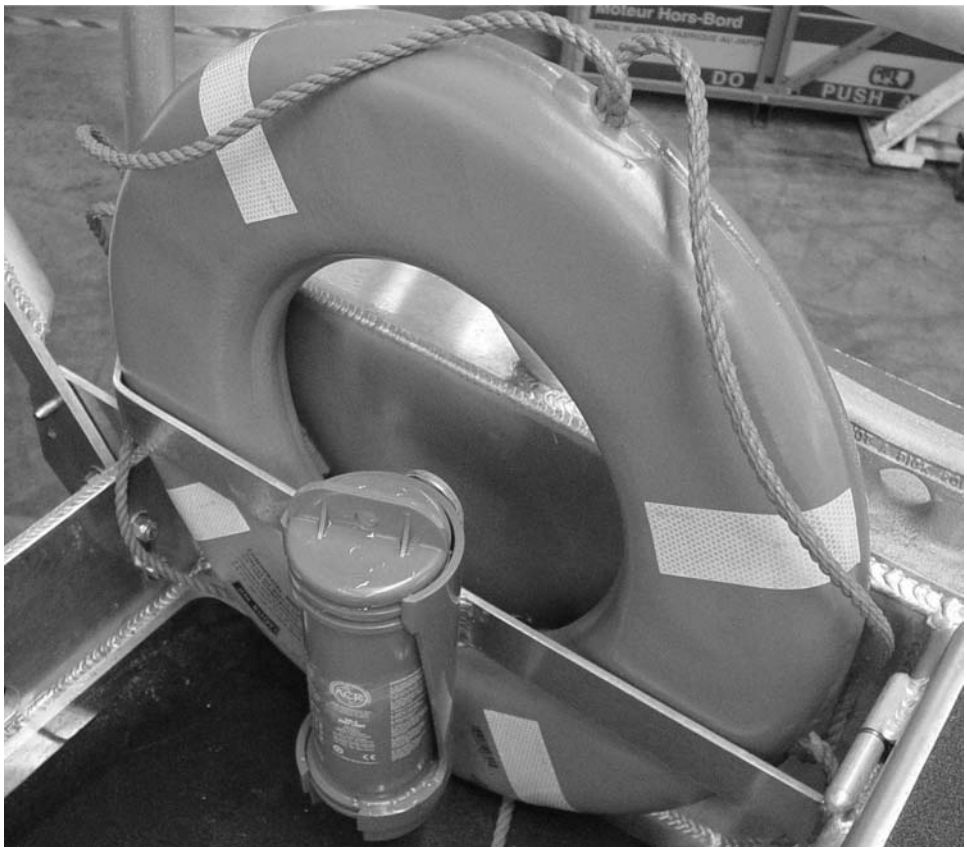

Figure 2-25
Ring Buoy and Strobe Light

C.11. Towline Reel

A fabricated towline reel (**Figure 2-26** (RB-HS) and **Figure 2-27** (RB-S)) is mounted on the aft face of the radar pod. The working end of the line is fitted with an eye splice and thimble to attach to the anchor chain. The towline reel has a ball-lock pin to keep the reel from rotating in the frame.

C.11.a. RB-HS Towline Reel

On the RB-HS, the reel is outfitted with 150 feet of ¾-inch double-braided nylon line, which can be used for towing or anchoring.

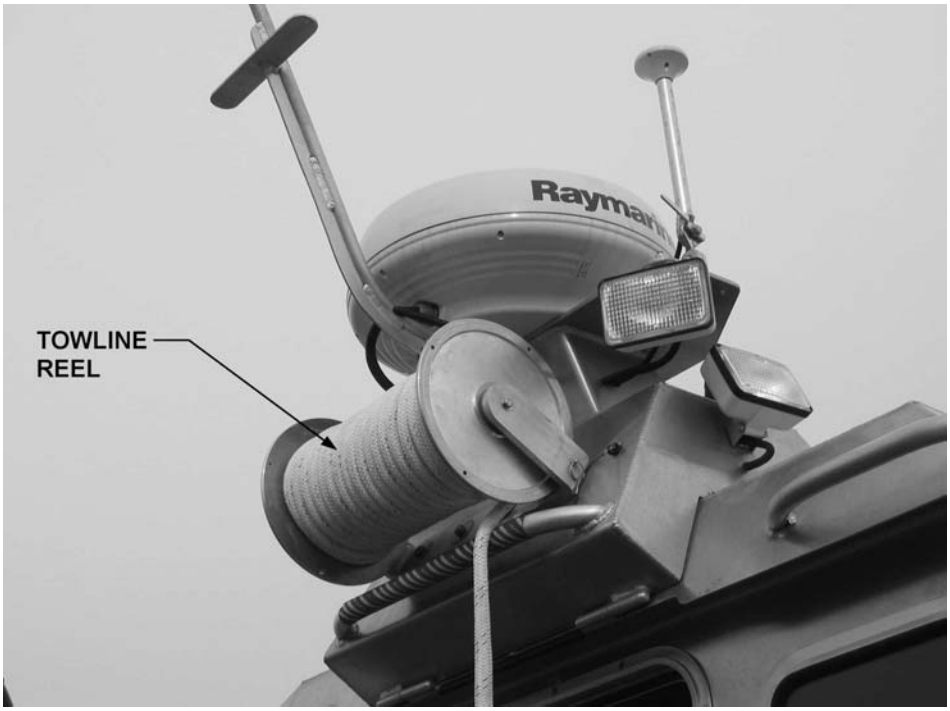

Figure 2-26
Towline Reel (RB-HS)

Figure 2-27
Towline Reel (RB-S)

C.11.b. RB-S Towline Reel

The towline reel on the RB-S is equipped with a manual, adjustable brake and 300 feet of ¾-inch double-braided nylon line (**Figure 2-28**).

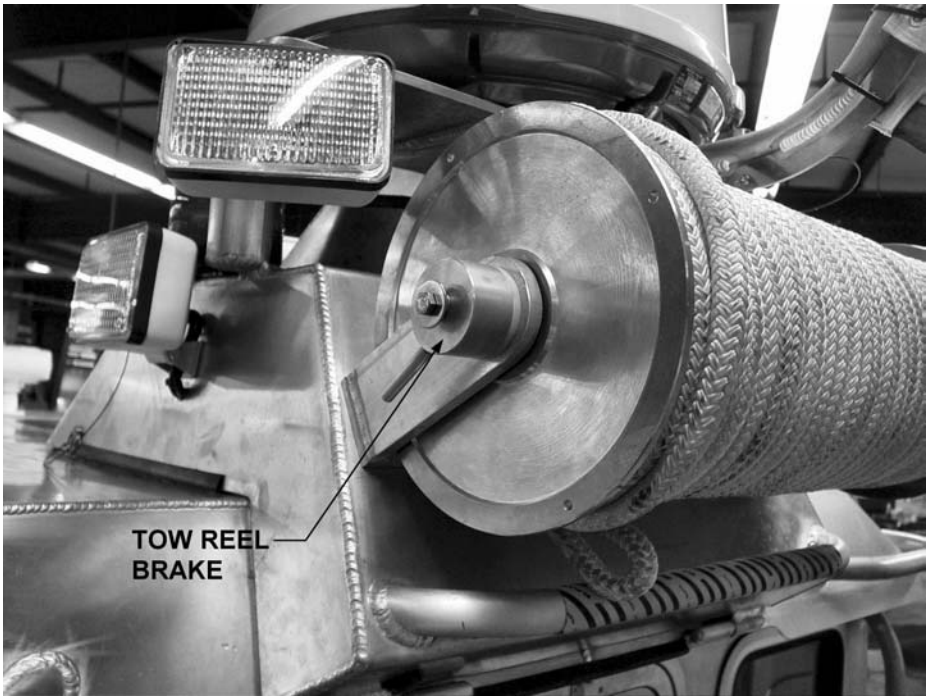

Figure 2-28
Tow Reel Brake (RB-S)

Section D. Main Deck Stowage

D.1. Anchor/ Ammunition Locker

An anchor/ammunition locker (**Figure 2-5**) with fabricated door, anchor tie-downs, and drain is located at the bow, forward of the bitt. The locker has drain holes that empty onto the foredeck and out through the shell discharge tubes. Storage shelves are built into the locker door to accommodate four cans of ammunition.

CAUTION !

The port aft deck locker is not to be used for storage due to risk of damage to the fuel system components.

D.2. Port Aft Deck Locker

The port aft deck locker (**Figure 2-29** (RB-HS) and **Figure 2-30** (RB-S)) contains access to the fuel tank and Wema™ fuel-sending unit. It contains the fuel management system, including the fuel filters, fuel pickup, vent tubing, and primer bulbs. The port locker provides accesses to the port side rig tube. On the RB-S, an in-line diesel fuel filter for the cabin heater is located inside the port aft deck locker.

Figure 2-29
Port Aft Deck Locker (RB-HS)

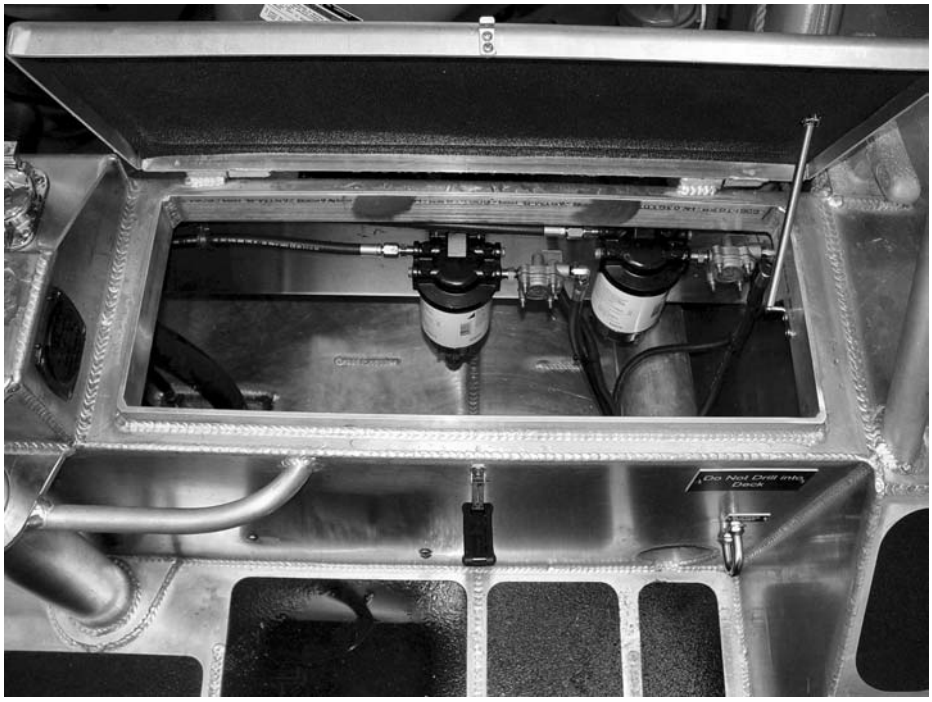

Figure 2-30
Port Aft Deck Locker (RB-S)

D.3. Starboard Aft Deck Locker

The starboard aft deck locker (**Figure 2-31** (RB-HS) and **Figure 2-32** (RB-S)) provides access to the rig tube for the outboard engines and a portable B-1 fire extinguisher. The boat's 12-VDC electrical system negative bus bar is located under a plastic cover on the forward bulkhead in the starboard aft deck locker. On the RB-S, the diesel fuel tank for the cabin heater is located in the starboard aft deck locker.

D.4. Pump Stowage

A portable pump can be strapped forward of the rear lockers using the lifting eyes and approved tie-down straps.

Figure 2-31
Starboard Aft Deck Locker (RB-HS)

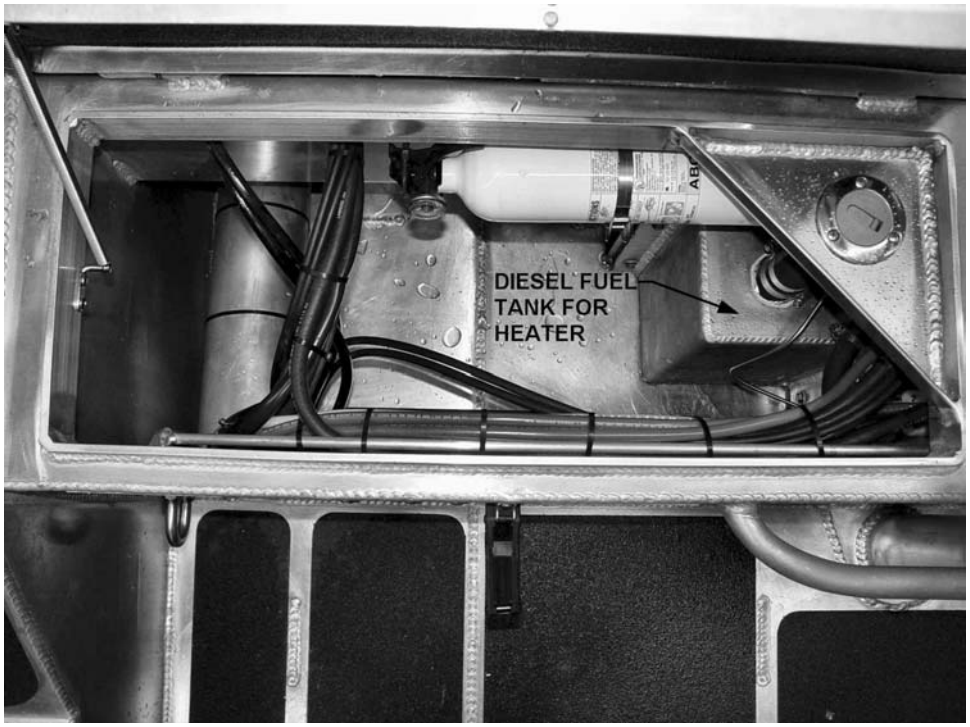

Figure 2-32
Starboard Aft Deck Locker (RB-S)

Chapter 3
Boat Systems

Introduction

This chapter discusses the boat's mechanical, electrical, and manual operating systems. It describes basic characteristics and provides information to allow the boat's crew to operate effectively.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Propulsion System	3-3
B	Hull System	3-17
C	Collar System	3-25
D	Steering System	3-29
E	Propulsion Fuel System	3-33
F	Communications/Navigation System	3-39
G	Communications/Navigation System (RB-S)	3-47
H	Electrical System	3-57
I	Seating System (RB-HS)	3-65
J	Seating System (RB-S)	3-67
K	Heating System	3-71
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M	Weapons Mounting/Stowage	3-83
N	Hull Exterior Lighting (RB-HS)	3-85
O	Hull Exterior Lighting (RB-S)	3-89
P	Ancillary Systems and Furnishings	3-97

Section A. Propulsion System

Introduction

The propulsion system for Defender Class boats consists of two Honda outboard engines (**Figure 3-1**) mounted on the transom.

NOTE

All references to engine locations are taken standing behind the engine propeller looking forward.

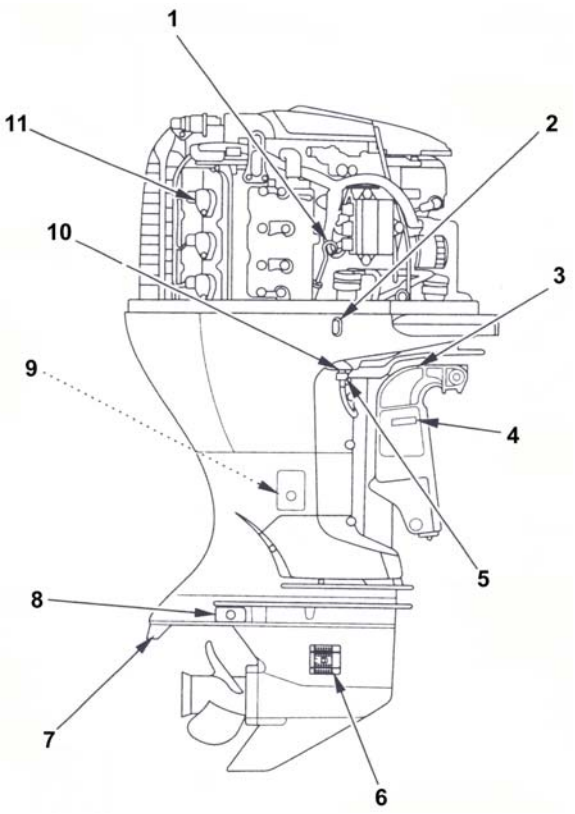
NOTE

When differences exist between the RB-HS and RB-S, they will be specifically identified in the text by hull designation.

Figure 3-1
Outboard Engine

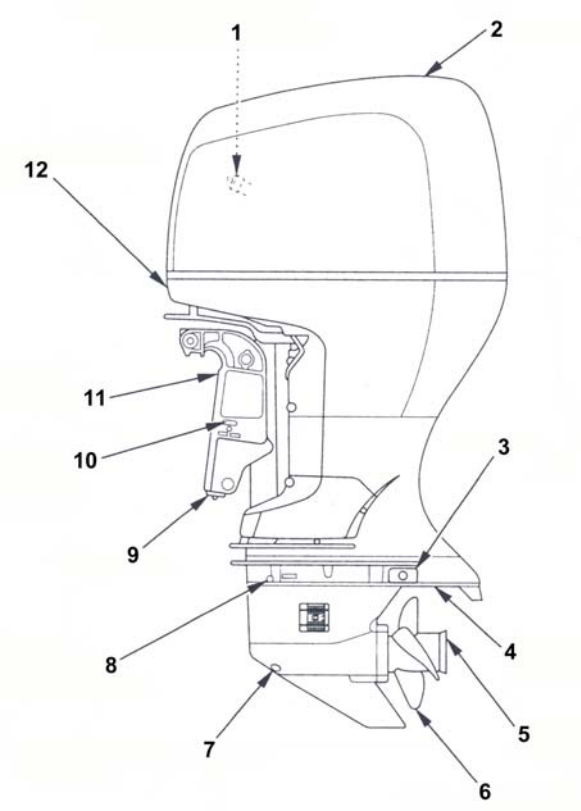
A.1. Engine

Each engine, rated 225 HP at 5500 RPM, is a four-stroke, V6, water-cooled engine with a single overhead cam. Engine displacement is 212 cubic inches (3741 cubic centimeters) with a 3½-inch bore and 3.66-inch stroke (89 by 93 millimeters). The operating weight of each engine is approximately 633 pounds. (see **Figure 3-2** and **Figure 3-3**)



1. Oil dipstick
2. Power tilt switch
3. Tilt lock lever
4. Frame serial number
5. Flush plug connector
6. Cooling water intake port
7. Trim tab
8. Zinc anode
9. Engine oil drain plug
10. Cooling system indicator
11. Spark plug

Figure 3-2
Outboard Engine (Starboard Side)



1. Oil filler cap
2. Engine cover
3. Zinc anode
4. Anti-ventilation plate
5. Exhaust port
6. Propeller
7. Gear oil drain plug
8. Gear oil level plug
9. Zinc anode
10. Manual relief valve
11. Stern bracket
12. Engine cover latch

Figure 3-3
Outboard Engine (Port Side)

A.2. Lubrication Systems

The engine oil system is a trochoid pump pressure system with a capacity of 8 U.S. quarts (7.6 liters) of SAE 10W-30, API standard (SG, SH, SJ). The engine oil dipstick (**Figure 3-2, 1**) is located under the engine cover on the starboard side of each engine. The oil filler cap (**Figure 3-3, 1**) is located under the engine cover on the forward port side of the engine. The oil drain plug (**Figure 3-2, 9**) is located on the starboard side of the engine behind a small rectangular cover, which is retained in place by a screw. A spin-on type, disposable oil filter is mounted on the back of the engine block directly above the engine fuel filter.

The gear case requires 1.24 U.S. quarts (1.17 liter) of SAE 90 outboard motor gear oil, API standard (GL-4/5). The gear case utilizes a splash-type lubrication system. A gear oil level plug (**Figure 3-3, 8**) is located on the forward port side of the engine directly above the anti-ventilation plate. The gear oil drain plug (**Figure 3-3, 7**) is located on the port side of the horizontal propeller shaft fairing.

A.3. Engine Cooling System

The engine cooling system consists of an impeller type pump and thermostat mounted on the engine. Two cooling water intake ports (**Figure 3-2, 6**) are located on the port and starboard sides of the lower outboard fairing directly above the horizontal propeller shaft. A cooling system indicator (**Figure 3-4**) on the starboard side of the engine cover shows that water is circulating through the engine cooling system.

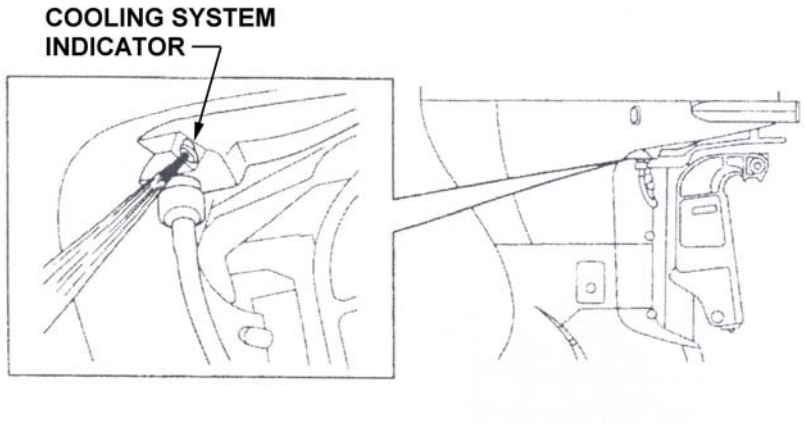


Figure 3-4
Cooling System Indicator

CAUTION ! The fuel system requires unleaded 86-octane gasoline or higher.

A.4. Engine Fuel System

An electric-powered mechanical fuel pump provides fuel to each cylinder as metered by an electronic fuel injection system. A priming bulb (**Figure 3-5**), located in the inlet line to the outboard engine, primes and pressurizes the outboard engine fuel system for starting. A water separator (**Figure 3-6**) is located beside the oil dipstick and provides a visual indication of the presence of water in the fuel. The separator should be cleaned when excessive water is present.

A fuel pump filter is located directly below the engine oil filter. The filter is mounted in a translucent cup to provide a visual indication of sediment or water. The filter is disposable and should be replaced periodically or when excessive sediment or water is observed.

Fuel for the outboard engines is stored in a hull-mounted fuel system.

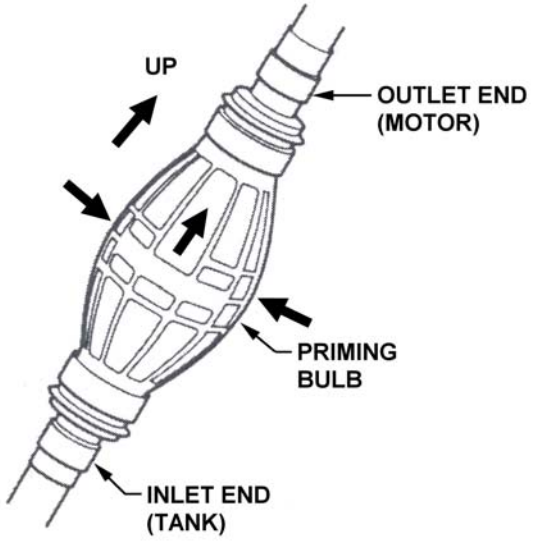


Figure 3-5
Fuel Priming Bulb

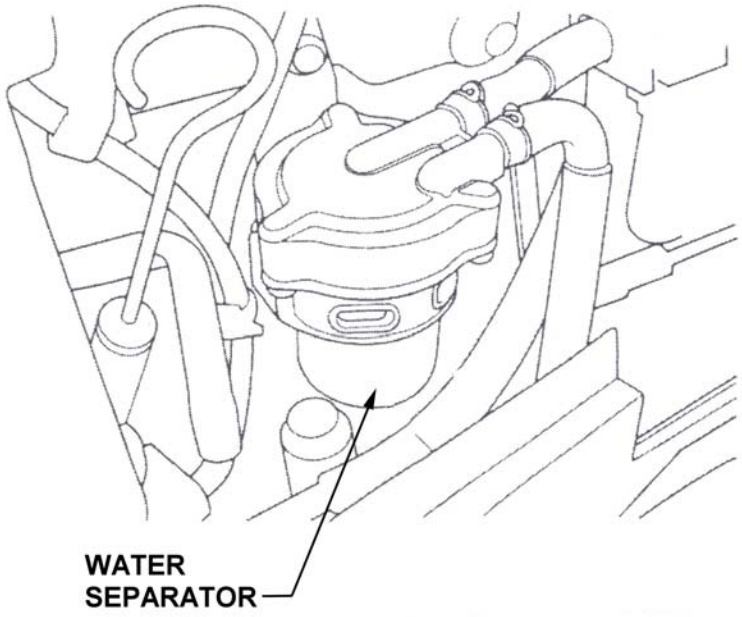


Figure 3-6
Water Separator

A.5. Ignition System

The ignition system is a fully transistorized battery ignition system with six spark plugs and six ignition coils (**Figure 3-2, 11**). The left and right engine undercovers must be removed to gain access to the plugs and coils. Spark plugs specified by the manufacturer are DENSO, part number VKJ20RZ-M11 or NGK, part number IZFR6F11.

A.6. Starter

A direct cranking starter is mounted on each outboard engine. The starter requires 12 VDC and 110 ampere hours.

A.7. Engine Controls

The gearshift and throttle control (**Figure 3-7**) for both engines is located on the starboard dash panel. Each lever controls engine RPM and ahead or astern movement. Moving the throttle lever 35 degrees from neutral selects the gear, forward or reverse, and further movement increases engine speed. The port throttle lever contains the power trim/tilt switches for both engines. These rocker-type switches, labeled UP and DN, change the angle of the outboard motor to trim the boat for normal operation, shallow water operation, beaching, launching, and mooring.

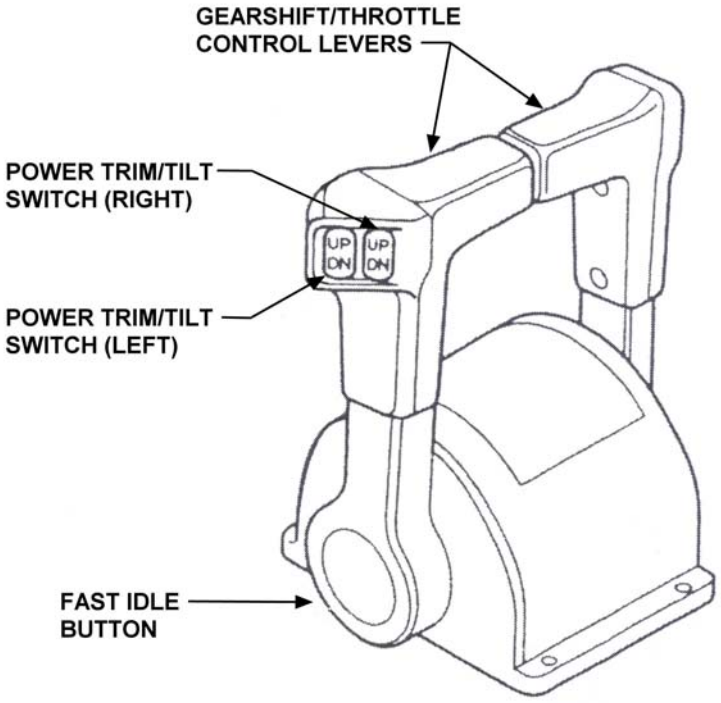


Figure 3-7
Gearshift and Throttle Control

A.8. Engine Key Switch Panels

On the RB-HS, there are two engine key switch panels (**Figure 3-8**) and on the RB-S there is one engine key switch panel (**Figure 3-9**) mounted below the gearshift and throttle control. Each panel has an ignition key switch for starting labeled OFF-ON-START. The key switch is interlocked to allow engine starting only with the throttle lever in *neutral*.

A.8.a. RB-HS Panels

One engine kill switch is installed next to the ignition key switch for each of the engines. The engine kill switch clip must be inserted in the engine kill switch in order for the engine to start and run. The kill switch clip is attached to an 18-inch lanyard, which is attached to the operator's PFD or boat crew survival vest. Should the operator/coxswain fall away from the controls, the engine(s) will immediately stop.

Engine warning lights are mounted above the key switches on the switch panels.

Figure 3-8
Key Switch Panels (RB-HS)

A.8.b. RB-S Panel

One engine kill switch is installed between the ignition key switches for both of the engines. The engine kill switch clip must be inserted in the engine kill switch in order for the engines to start and run. The kill switch is attached to an 18-inch lanyard that is attached to the operator's PFD or boat crew survival vest. Should the operator/coxswain fall away from the controls, the engines will immediately stop.

Engine warning lights are mounted above the key switches on the switch panel.

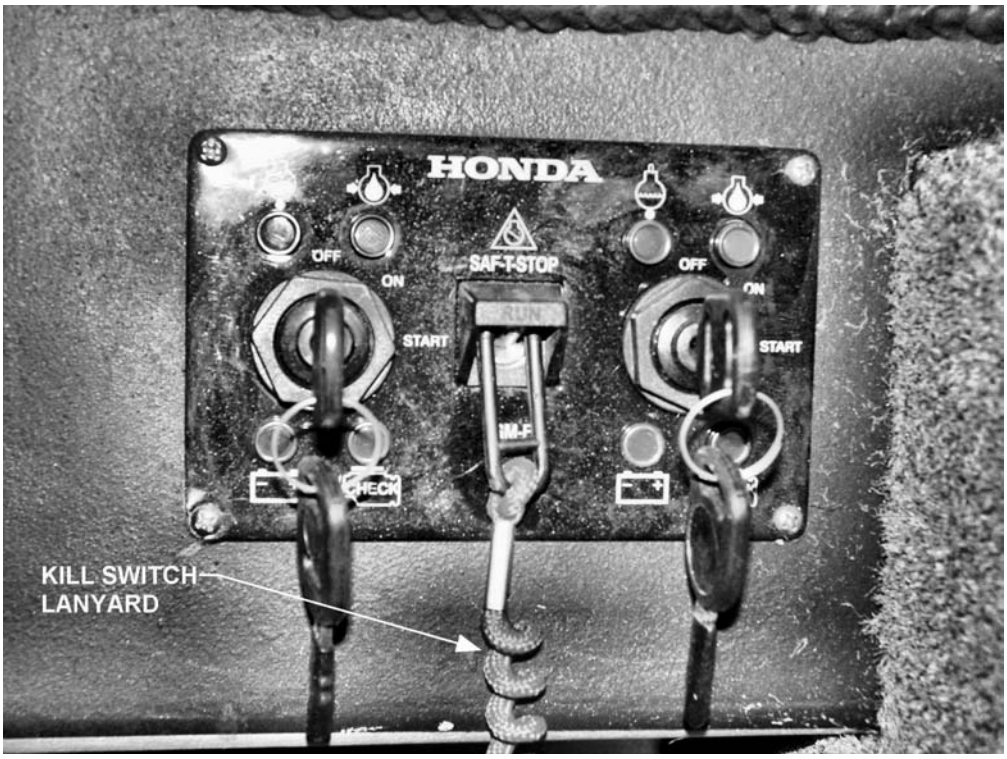


Figure 3-9
Key Switch Panel (RB-S)

CAUTION ! The engines must be up and locked for all trailering evolutions.

A.9. Power Tilt Switch

The power tilt switch (**Figure 3-10**) is mounted on the starboard side of the engine cover. The power tilt switch will operate without turning the ignition *on*. The switch is used when the engine is stopped to raise the engine for mooring, trailering, or maintenance.

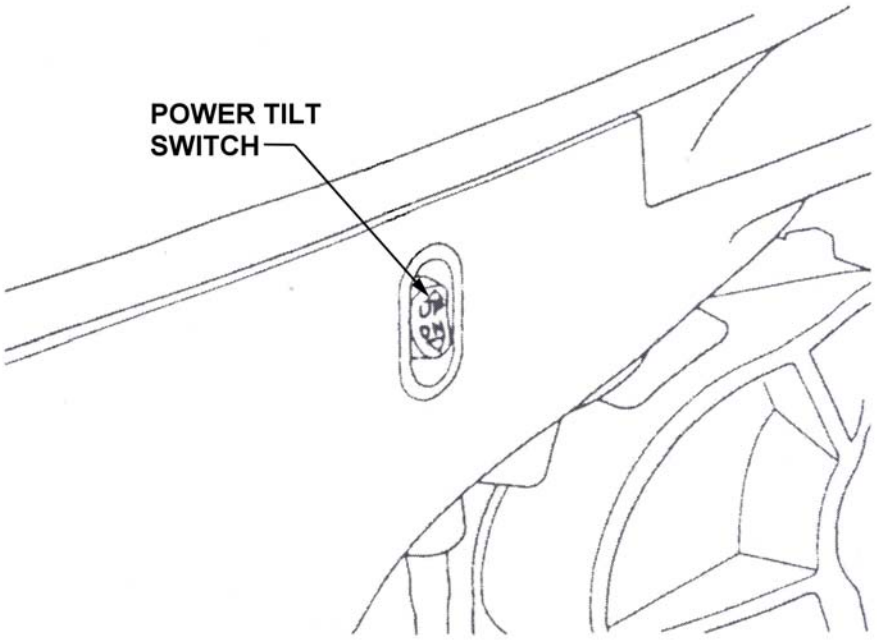


Figure 3-10
Power Tilt Switch

A.10. Manual Relief Valve

The manual relief valve (**Figure 3-11**) is located on the port side of the engine's stern bracket and is used in conjunction with the tilt lock lever. By inserting a screwdriver in the manual release valve and turning the screw, the engine can be manually tilted and locked.

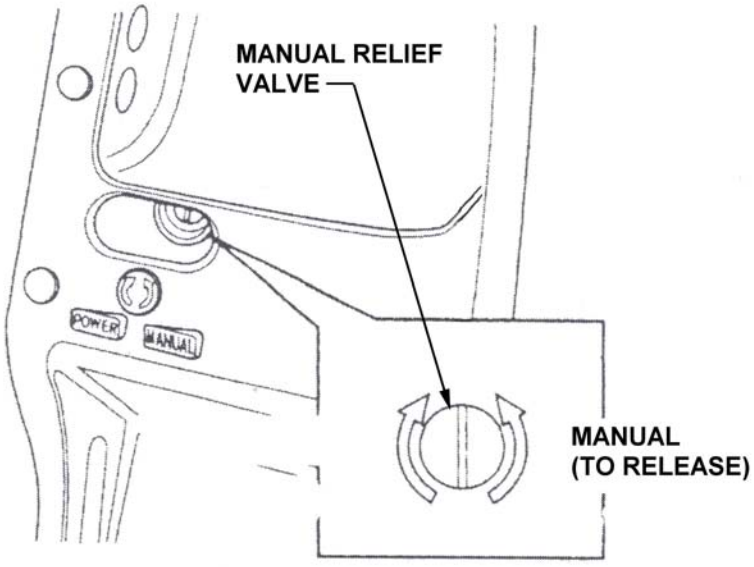


Figure 3-11
Manual Relief Valve

A.11. Tilt Lock Lever

The tilt lock lever (**Figure 3-12**) is used to support the engine in the *fully raised* position. The lever is located between the engine housing and the frame of the engine.

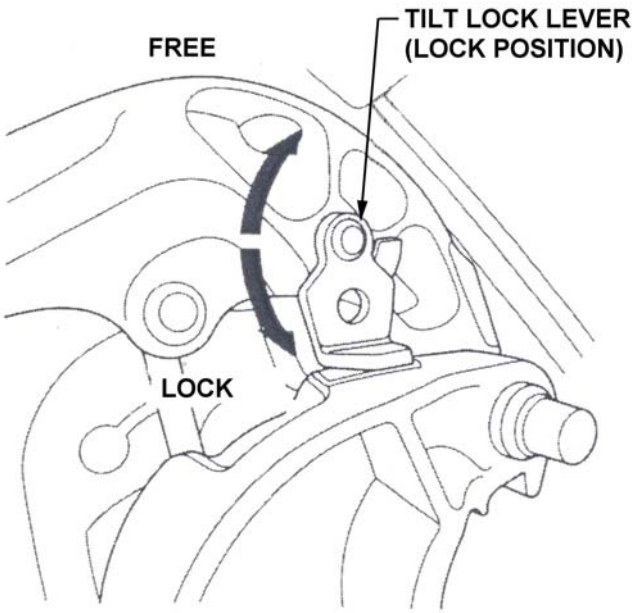


Figure 3-12
Tilt Lock Lever

A.12. Sacrificial Zinc Anodes

Sacrificial zinc anodes (**Figure 3-2, 8** and **Figure 3-3, 3, 9**) are used to protect the outboard motor from corrosion. Two of the anodes are located on the gear case, one on the stern bracket, and two small anodes are located in the water passages of the engine block.

A.13. Engine Exhaust Port

The engine exhaust gases are discharged around the propeller shaft (**Figure 3-3, 5**) and through the hub of the propeller.

A.14. Fuse Panels

Two fuse panels are located under the outboard engine cover (**Figure 3-13**). The side-mounted fuse panel houses 10-amp, 15-amp, and 30-amp fuses for the ignition switch circuit, power trim/tilt switch circuit, and electric starter circuit. The top-mounted fuse panel houses the 150-amp alternator/charging circuit fuse.

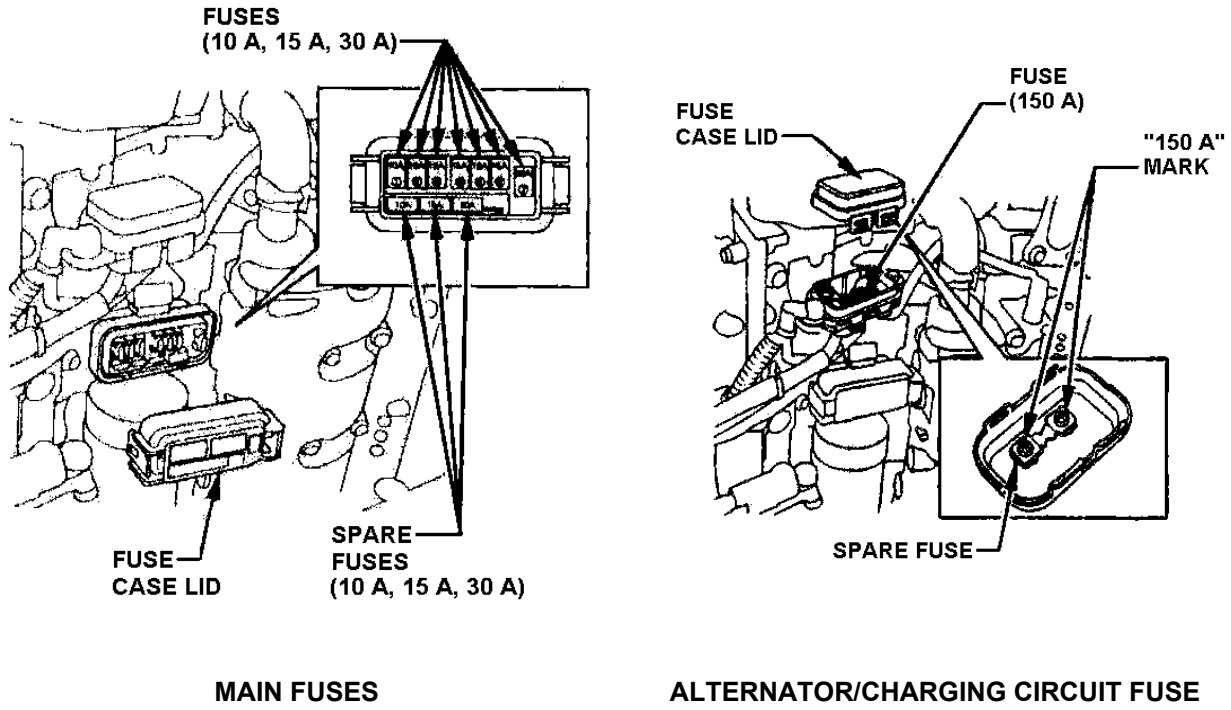


Figure 3-13
Fuse Panels

CAUTION ! The left- and right-hand propellers ARE NOT interchangeable.

CAUTION ! Changing the propeller configuration will change the operating characteristics of the boat. Any recommended changes must be submitted in accordance with the *Naval Engineering Manual*, COMDTINST M9000.6 (series).

A.15. Propellers

Defender Class boats utilize a stainless steel, four-blade propeller, with a 14-inch diameter and 19-inch pitch.

A.16. Flo-Torq Assembly

To protect the propeller, engine, and lower gear unit gears, Defender Class boats have the Mercury Marine Flo-Torq II propeller cushion hub kit (**Figure 3-14**) on the installed propellers. The hub kit reduces the shock on the lower unit gears and engine when shifting gears, and also absorbs shock if the propeller hits an object. The hub kit is a safety device designed to break down and slip under excessive torque loading. The cost of the sacrificial cushion hub replacement is relatively inexpensive when compared with expensive engine damage.

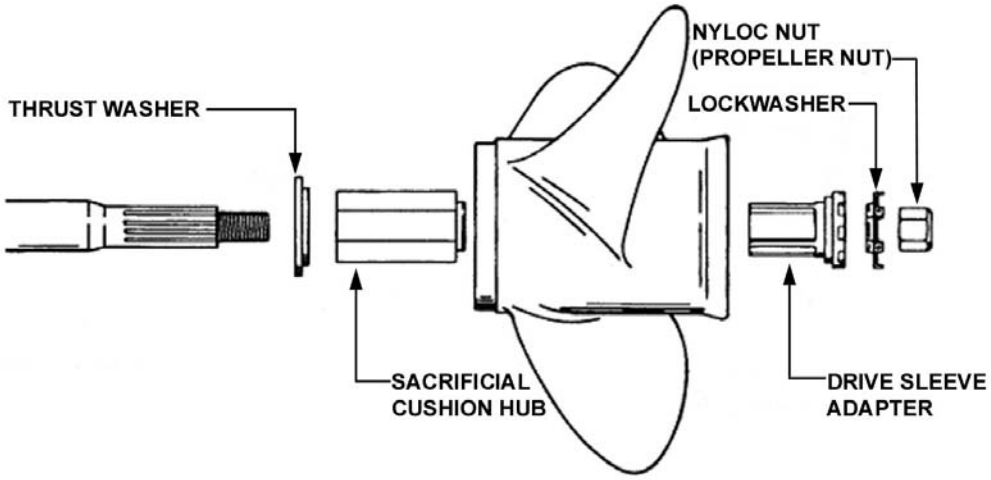


Figure 3-14
Flo-Torq II System

Section B. Hull System

Introduction

The boat's hull is fabricated from 5086 marine grade aluminum. The hull's design is a deep-V mono-hull with a pointed bow and flat transom. The deadrise is 25 degrees at the transom; defined as the angle between the baseline plane and the hull bottom when measured perpendicular to the boat's centerline.

The hull consists of ¼-inch 5086 marine grade aluminum bottom plating. The decks and side plating are 3/16-inch 5086 marine grade aluminum. The boat has a fixed fender system to protect the exterior of the hull during alongside work. The boat's hull has sufficient buoyancy and stability to float upright with the fendering system removed.

CAUTION !

With the engines trimmed to the maximum depth and the boat making no headway, the draft is 39 inches.

B.1. Draft

The hull's deepest draft with the engines raised is at the step, which is on the keel at bulkhead 1, forward of the transom (**Figure 2-1**).

B.2. Sound Insulation

A layer of two-part, maintenance free, polyurethane foam covers the bottom 4 inches of the hull. The foam is flame retardant and complies with ASTM flame spread requirements. The foam's main purpose is to provide sound insulation. No polyurethane foam is installed directly below the fuel tank in the bilge area on the RB-S.

B.3. Performance Fins

The performance fins (**Figure 3-15**) are located port and starboard below the aft portion of the collar. They provide lift upon acceleration and create a vacuum for stabilization during turning.

B.4. Lifting Strakes

The hull contains three custom lifting strakes (**Figure 3-15**) on each side of the V bottom hull to improve seakeeping, directional stability, and planing performance.

B.5. Beaching Plate

A ¼-inch 5086 marine grade aluminum beaching plate (**Figure 3-16**) is welded to the keel along the forefoot to provide additional protection to the hull.

Figure 3-15
Performance Fin and Lifting Strakes

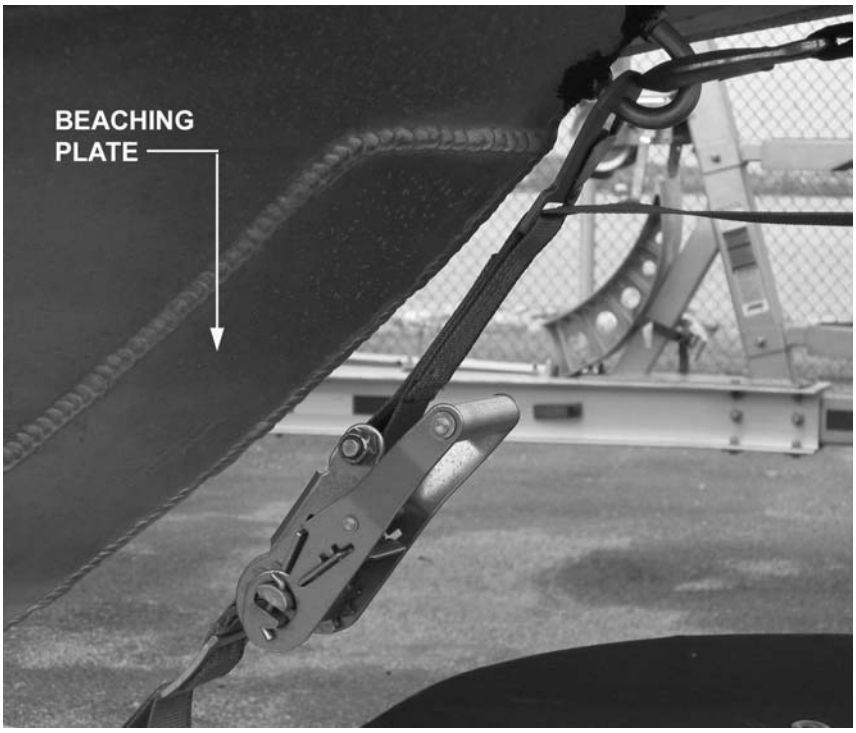


Figure 3-16
Beaching Plate

B.6. Inspection Access	Two ½-inch inspection plugs are located inside the cabin near frames 7½ and 13½. A borescope is required for internal inspection.
B.7. Diagonal Stiffeners	The ¼- by 3-inch diagonal stiffeners (**Figure 3-17**), spaced 12 inches apart, are designed to efficiently disperse impact energy. This unique herringbone framing directs impact energy along its natural course of flow.
B.8. Rig Tubes	Rig tubes are located directly below the main deck on the port and starboard sides and terminate at watertight bulkhead 13½, where they interconnect with the transverse rig tube. There are multiple access points to the rig tubes.
B.9. Hull Access Plug	The hull access plug is located forward of the transducer in the step. This can be used for hull draining and borescope access.

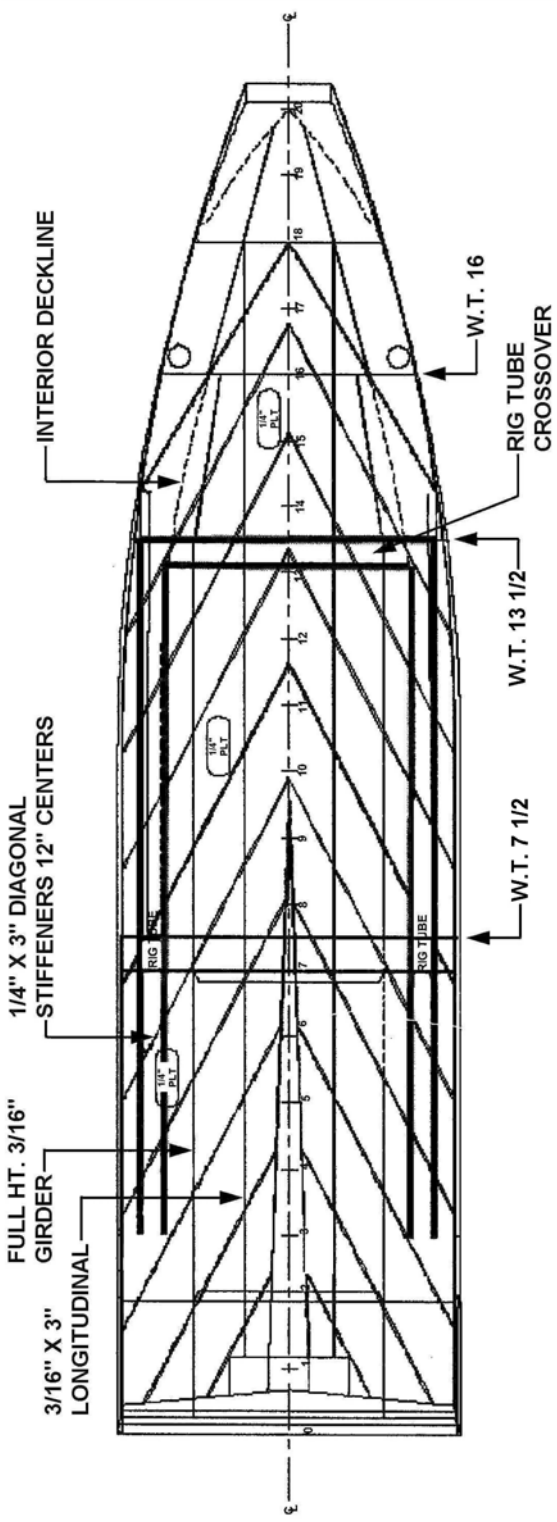


Figure 3-17
Hull Construction Top View

B.10. Deck Drains and Scuppers

There are six deck drains and four scuppers on the RB-HS and RB-S as follows:

- 2 Forward Cabin Deck Drains
- 2 Forward Cabin Deck Scuppers
- 2 Aft Weather Deck Drains
- 2 Aft Well Deck Drains
- 2 Aft Weather Deck Scuppers

B.10.a. Forward Cabin Deck Drains

Two 2½-inch diameter drains are located in the aft, outboard corners of the forward cabin deck, just forward of the cuddy cabin door (**Figure 3-18**).

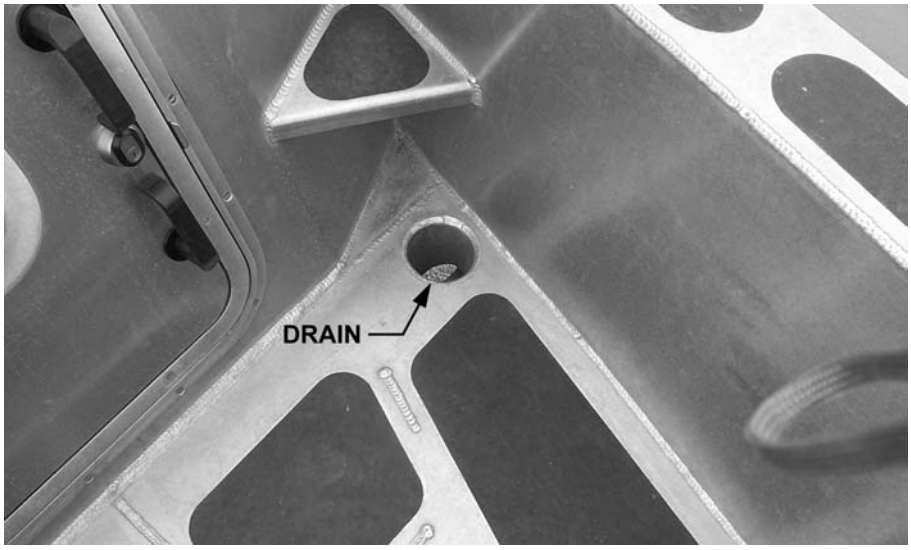


Figure 3-18
Forward Cabin Deck Drain

B.10.b. Forward Cabin Deck Scuppers

The forward cabin deck drains interface with scoop type scuppers (**Figure 3-19**) under the hull to allow water taken over the side to drain from the boat.

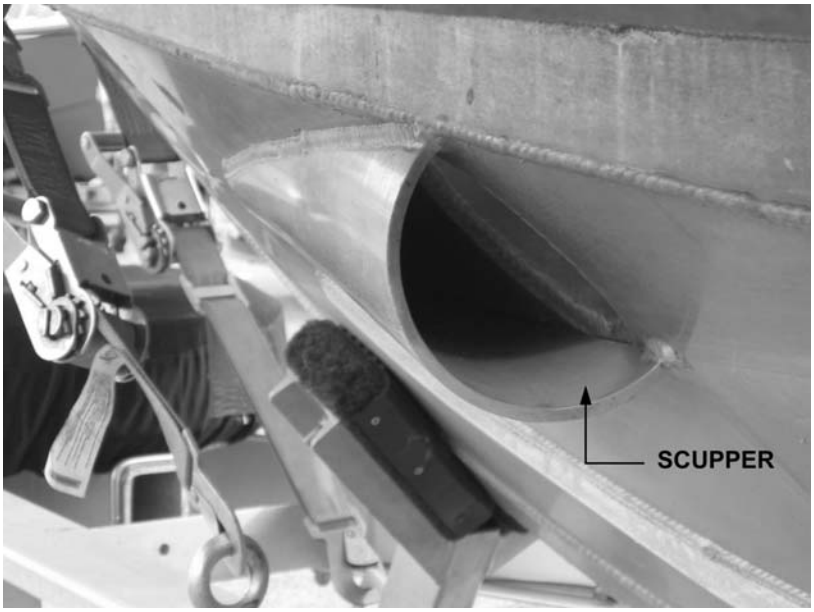


Figure 3-19
Forward Cabin Deck Scupper

B.10.c. Aft Weather Deck Drains

Two 2½-inch diameter drains are located in the lower outboard corners on the forward bulkhead of the aft storage lockers (**Figure 3-20**). These drains allow water to drain through the scupper/water socks (**Figure 3-21**) mounted on the transom.

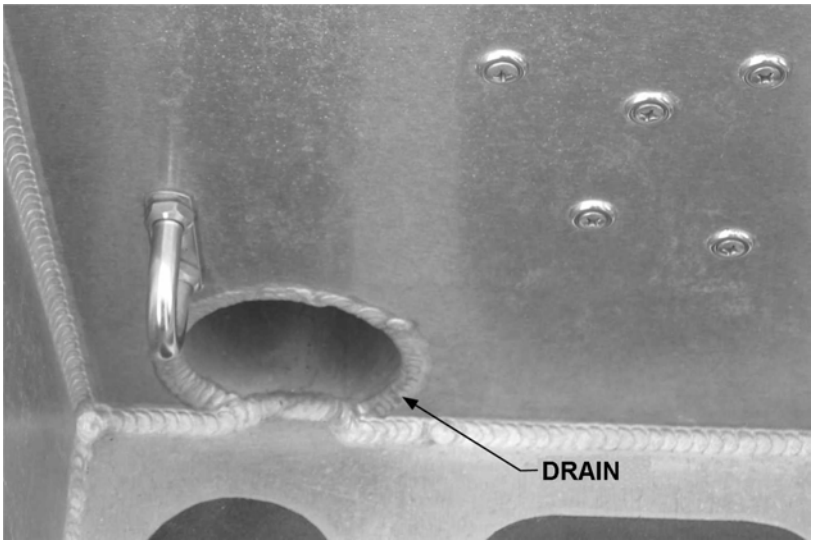


Figure 3-20
Aft Weather Deck Drain

Figure 3-21
Aft Weather Deck Scupper/Water Sock

B.10.d. Aft Well Deck Drains

The aft well deck is drained using two oblong openings in the transom, outboard of the engines, just above the deck level.

B.10.e. Aft Locker Drain Plugs

Two drain plugs located on the transom just inboard of the aft well deck scuppers (water socks) can be removed to drain the aft lockers (**Figure 3-22**).

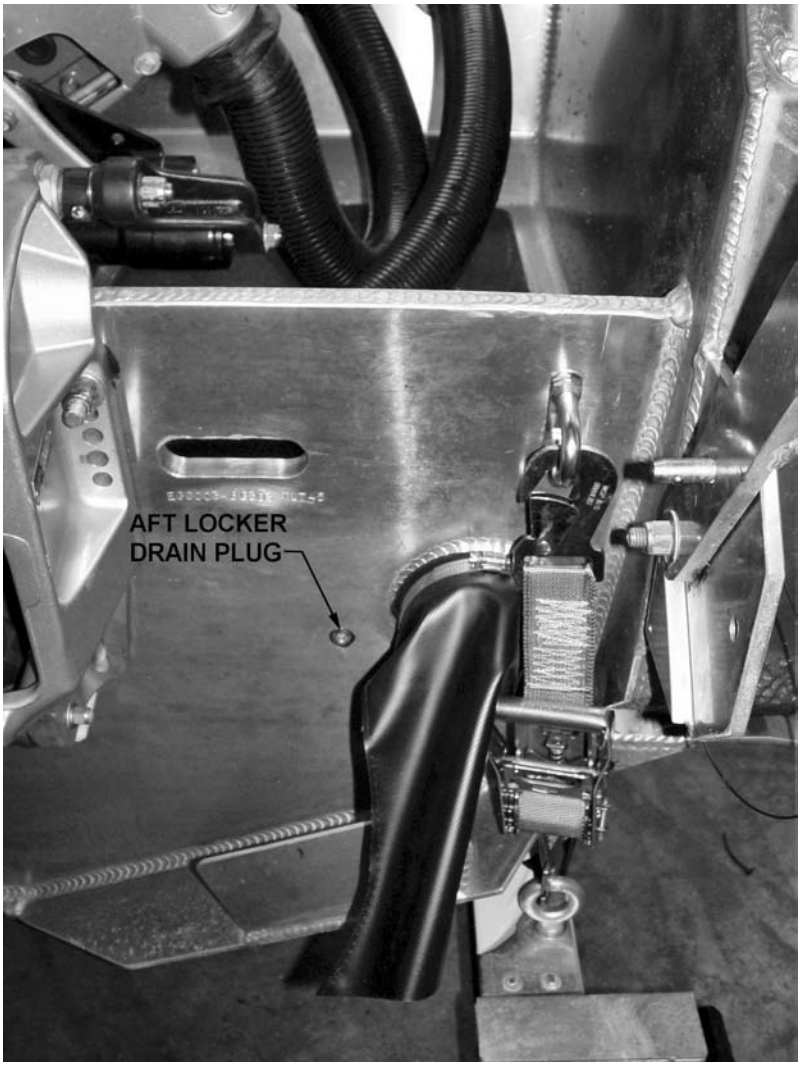


Figure 3-22
Aft Locker Drain Plug

Section C. Collar System

Introduction

The patented SAFE™ (Secured Around Flotation Equipped) collar system is designed to provide flotation, fendering, and stability. The collar core is constructed of solid, closed-cell, polyethylene foam. The coating is exceptionally tough, scuff-resistant, UV stable polyurethane. If damage to the collar occurs, it is easily repaired at the unit level. The collar is capable of absorbing major impact and returning to its original shape. Damaged sections can be easily repaired or replaced as necessary.

The water-contacting surface of the collar is protected by an aluminum flange, which protects it from damage.

C.1. Attachment

The two side collar sections are bolted (**Figure 3-23**) directly to the outside of the hull using stainless steel lag bolts. On the RB-S, the collar attachment bolts thread into ultra high molecular weight (UHMW) plastic blocks located at the collar attaching gussets.

The bow section on the RB-HS (**Figure 3-24**) is bolted through the hull and the bow collar reinforcement bracket (BCRB) for improved impact resistance. On the RB-S only, the collar bow section is outfitted with a protective cover (**Figure 3-25**) equipped with a rub strake.

Figure 3-23
Side Collar Attaching Bolt

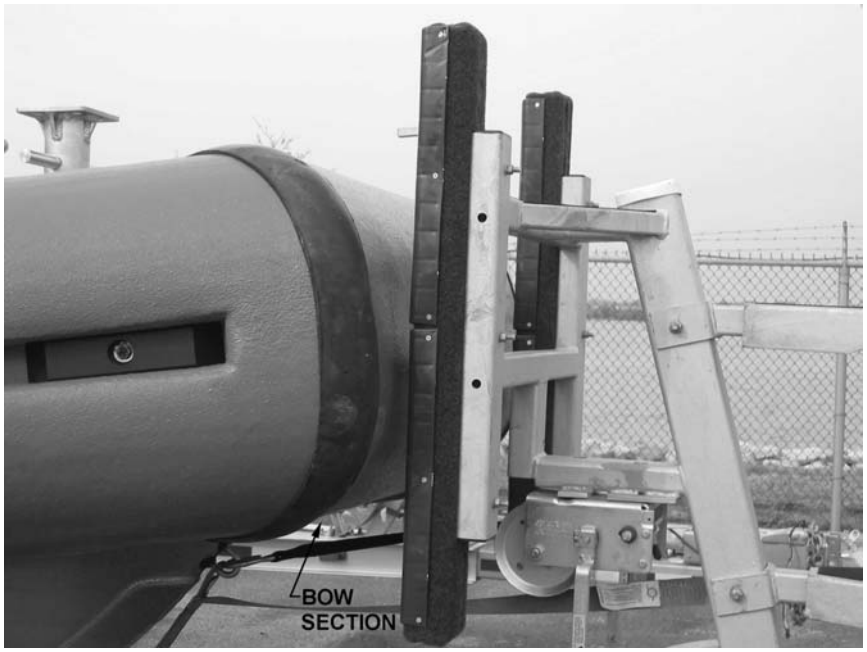


Figure 3-24
Collar (Bow Section)

Figure 3-25
Bow Cover, RB-S

CAUTION !

The daily checkoff sheet requires a thorough inspection of the collar. Immediately repairing any damage that penetrates the polyurethane coating (skin) is critical. Failure to do so may result in further damage to the area requiring extensive repair.

CAUTION !

Ensure that the required personal protective equipment (PPE) is used when sanding or abrading paint on the collar.

C.2. Repair and Removal

Minor repairs are easily completed within 24 hours. Repair procedures for both repair and removal are posted on the SAFE™ Boats International website.

Section D. Steering System

Introduction

The steering system (**Figure 3-26**) is an integrated system made up of three major components as follows:

- Hydraulic steering cylinder
- Tie bar assembly
- Helm pump assembly

CAUTION !

Never use brake fluid in the steering system. Use of non-specified fluids may cause irreparable damage and steering system failure.

The hydraulic system operates on standard hydraulic fluid. The recommended fluid for the steering system is Sea Star Hydraulic Fluid HA5430 or any hydraulic fluid meeting MIL-H-5606 specifications. Automatic transmission fluid (ATF) could also be used in an emergency. The system is filled with fluid and then bled free of any air bubbles.

D.1. Hydraulic Steering Cylinder

The Sea Star steering cylinder (**Figure 3-27**) is a front-mount system that is compatible with twin-engine, independent tilt. It allows for easy hydraulics and has a five-turn lock-to-lock response. It is a general purpose cylinder rated for up to 600 HP on a counter-rotating, twin-engine application.

D.2. Tie Bar Assembly

The tie bar (**Figure 3-27**) is a ½-inch solid, stainless steel rod. It has an adjustable ball joint on one end and a rod end connector on the other. The rod is protected by a stainless steel stringer tube, which provides added stability and acts as a stop for the rod end fittings. The purpose of the tie bar is to provide equal, uniform directional control of the engines, but does not interfere with independent trim, tilt, and throttle.

D.3. Helm Pump Assembly

The helm pump assembly (HPA) is mounted in the console and is a multiple position tilt system. The Momo® wheel (**Figure 3-28** (RB-HS) and **Figure 3-29**, (RB-S)) is attached to the $^{5}/_{8}$-inch shaft on the HPA. The hydraulic lines from the steering cylinder connect into the rear of the HPA. On the RB-S, an expansion tube/vent is installed in the top of the helm pump to allow for additional fluid expansion.

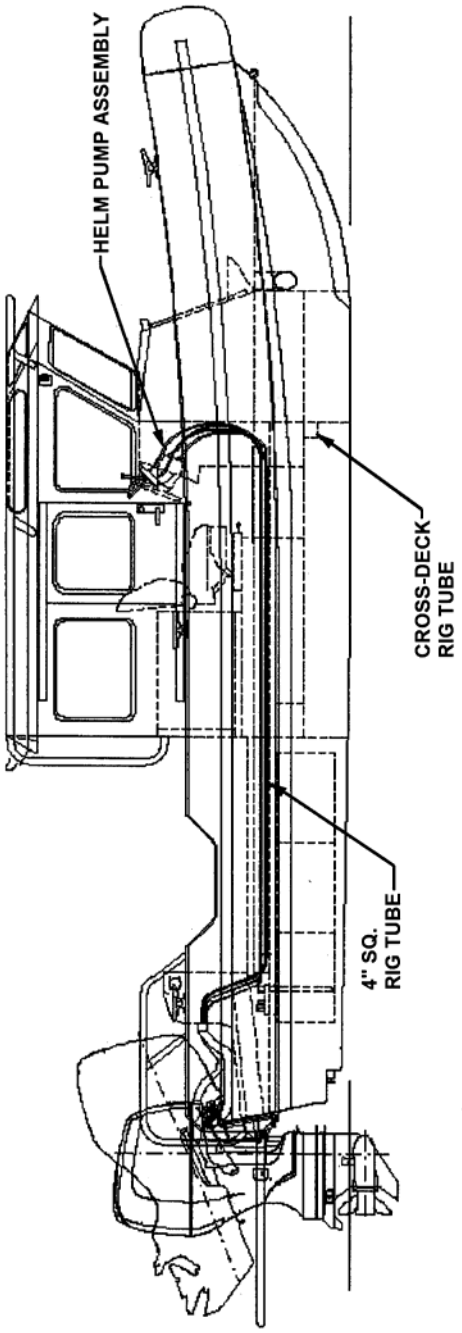


Figure 3-26
Steering System

Figure 3-27
Steering Cylinder and Tie Bar

Figure 3-28
Steering Wheel and Helm Pump (RB-HS)

Figure 3-29
Steering Wheel, Helm Pump, and Expansion Tube/Vent (RB-S)

D.4. Hoses

Hydraulic hoses, compatible with fluids that meet MIL-H-5606 specifications, connect the helm with the twin, front-mounted steering cylinders mounted on the transom. The hoses are routed through conduit to prevent chaffing or contact and interference with equipment or the hull structure.

Section E. Propulsion Fuel System

CAUTION ! A separate diesel fuel system is installed for the cabin heater. Great care must be taken to ensure that the correct fuel is provided to each system during re-fueling operations, or serious engine or heater damage may result.

Introduction

On the RB-HS, the propulsion fuel system provides 118 gallons (95%) of burnable gasoline for operating the two outboard engines.

On the RB-S, the propulsion fuel system provides 100 gallons (95%) of burnable gasoline for operating two outboard engines.

E.1. Fuel Tank

The fuel tank (**Figure 3-30**) is constructed of ¼-inch welded 5086 marine grade aluminum. Transverse baffles restrict free surface movement of the fuel. The bottom is rolled (no seams) with doublers on either end, welded to flanges that are mounted on shock absorbent rubber isolation pads. Doubler plates isolate the tank from mounting brackets. Rubber mounts isolate the tank from the hull.

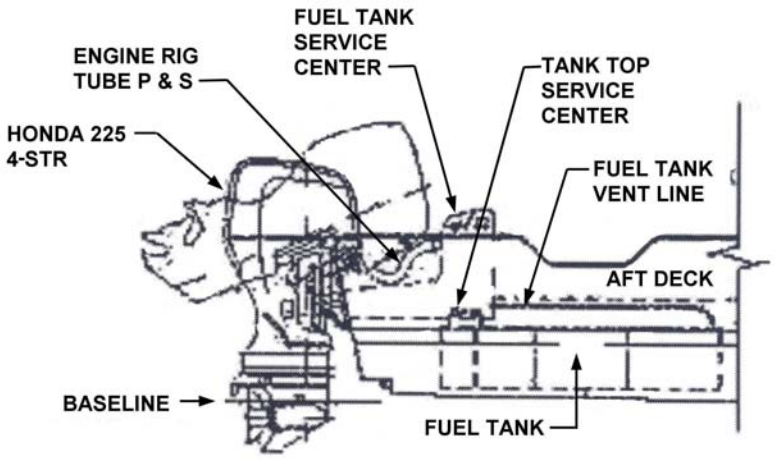


Figure 3-30
Fuel System (RB-HS)

E.2. Fuel Tank Vent (RB-HS)

The fuel tank vent line is accessed through a removable deck plate located in the center of the aft well deck, aft of frame 7 on hulls 255001 through 255086. The last thirteen RB-HS boats have the same fuel tank vent system as that for the RB-S (see *E.3*).

E.3. Fuel Tank Vent (RB-S)

The fuel tank vent line (**Figure 3-31**) is integral to the fuel tank and connects to the vent.

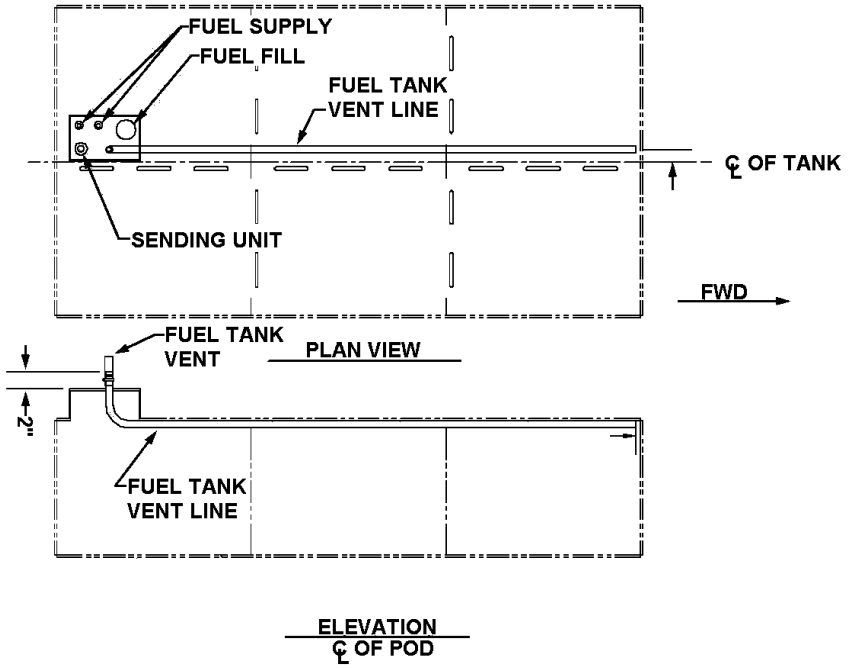


Figure 3-31
Fuel Tank (Gasoline) Vent System (RB-S)

E.4. Fuel Tank Fill (Gasoline)

The propulsion fuel tank (gasoline) fill cap for both the RB-HS and RB-S (**Figure 3-32** and **Figure 3-33**) is located between the port and starboard aft equipment lockers. The vent (**Figure 3-32**) for the RB-HS propulsion fuel tank is located directly above and aft of the fill cap. On the RB-S (**Figure 3-33**), the propulsion fuel tank and diesel fuel tank vents are located above and aft of the fill cap.

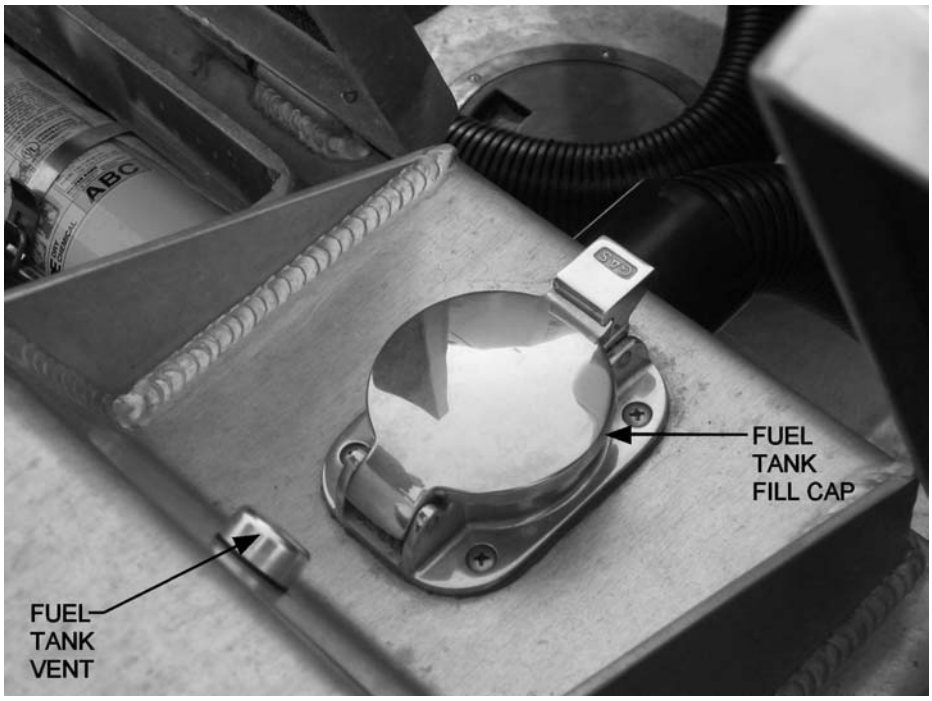


Figure 3-32
Fuel Tank Fill (Gasoline) (RB-HS)

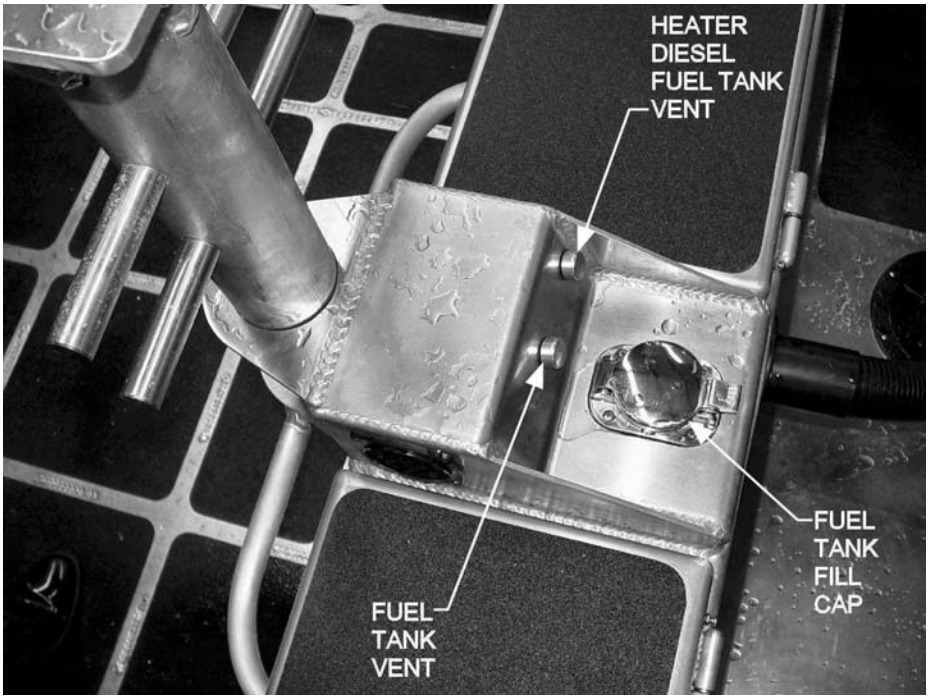


Figure 3-33
Fuel Tank Fill (Gasoline) (RB-S)

E.5. Fuel Filters/Water Separators

Each outboard engine has a separate fuel filter/water separator (**Figure 3-34**) mounted in the aft port storage box. The filters have a translucent bowl that allows for visually determining the presence of water in the fuel. Each filter is rated at 60 gallons per hour (GPH) and has a 10-micron, disposable filter element.

Figure 3-34
Fuel Filters/Water Separators

E.6. Primer Bulbs

Two primer bulbs (**Figure 3-35**), one for each engine, are located in the port aft storage box.

Figure 3-35
Primer Bulbs

E.7. Fuel Tank Level Sensor

The fuel tank level sensor (**Figure 3-36**) is located in the aft port storage box adjacent to the fuel tank fill hose. The tank sensor transmits the known fuel tank quantity to the fuel tank indicator on the starboard instrument panel.

Figure 3-36
Fuel Tank Level Sensor

Section F. Communications/Navigation System (RB-HS)

Introduction

All of the standard marine communications and navigation equipment is mounted in the cabin of the RB-HS.

NOTE

Frequent operations and position reports between the boat and its operational control (OPCON) are critical to crew safety and timely mishap follow-up. Every boat must have the capability for communicating by radio to the station and other vessels. For radio protocol, channel selection, and additional radio communication information, refer to *Chapter 11* in the *Boat Crew Seamanship Manual,* COMDTINST M16114.5 (series); the *Telecommunications Manual*, COMDTINST M2000.3 (series); and the *Radiotelephone Handbook*, COMDTINST 2300.7 (series).

F.1. Motorola VHF-FM Astro Spectra W9 Transceiver and Control Head

The Motorola VHF-FM Astro Spectra W9 control head (**Figure 3-37**) is mounted in the cabin on top of the port dash panel. The transceiver is located forward of the coxswain console and is accessible through the cuddy cabin. The transceiver is used for communicating on VHF marine band frequencies, 146 to 174 MHz. The transceiver meets the digital encryption standard (DES) requirements for APCO 25. The radio requires a 12-VDC power input. The radio antenna is located atop the cabin, port side.

Figure 3-37
Motorola VHF-FM Astro Spectra W9 Control Head

F.2. Raymarine 215 VHF Transceiver

The Raymarine 215 VHF transceiver (**Figure 3-38**) is a microprocessor controlled, digitally synthesized VHF transceiver. The transceiver provides two-way communications on marine channels and monitoring of 10 separate weather channels. The transceiver has built-in digital select calling (DSC) for sending and receiving DSC distress, all ships, individual ship, and group call communications. The radio requires 12-VDC input and has a 25- or 1-watt power setting. The antenna is located atop the cabin, starboard side. The transceiver can transmit on frequencies 156.025 to 157.425 MHz and receive on frequencies 156.050 to 163.275 MHz. The transceiver is located on the OHIP, port side.

Figure 3-38
Raymarine 215 VHF Transceiver

F.3. Raymarine 430 Loudhailer

The Raymarine 430 loudhailer (**Figure 3-39**) requires a 12-VDC input and provides 30 watts of output power to the loudhailer speaker on the forward face of the radar pod. The loudhailer has eight programmable foghorn signals to be used when operating in conditions of low visibility. The loudhailer and microphone are mounted on the port side of the dash panel.

Figure 3-39
Loudhailer

F.4. Raytheon RL80CRC Radar

The Raytheon RL80CRC radar display (**Figure 3-40**) is mounted on top of the dash panel on the centerline. This surface radar/chart plotter can display various input and exchange this information simultaneously in full screen, split screen, or overlay screen modes. The RL80CRC has a 10.4-inch daylight viewable, color display and is GPS compatible. The RL80CRC contains a ten-target mini automatic radar plotting aid (MARPA) for tracking radar targets and providing risk assessment and tracked target data that includes range, bearing, speed, course, closest point of approach, and time to closest point of approach. A man overboard (MOB) mode provides a readout that shows range, bearing, latitude, and longitude of MOB, and time elapsed since MOB.

F.4.a. Radome Antenna

The radar antenna is a compact Raymarine 2-kW radome antenna that has a maximum range of 24 nautical miles (NM). The radome can operate with an input voltage of 10.7 to 32 VDC.

F.4.b. GPS Receiver/ Antenna

The 12-channel Raystar 120 Sea Talk GPS receiver/antenna is mounted on the radar pod. The receiver/antenna provides GPS correction signals to the RL80CRC radar.

Figure 3-40
Radar/GPS

F.5. Depth Sounder Display

The Raytheon CRP-ST-60 depth sounder display (**Figure 3-41**) is mounted on the centerline of the OHIP. The depth sounder transducer is located forward of the transom. When first turned *on*, the depth sounder will show the current depth. The depth sounder memorizes the minimum and maximum depth while it is turned *on*, and these quantities can be recalled and displayed.

The depth sounder also employs a depth trend indicator to indicate a rising or lowering seabed. Deep and shallow threshold limits can be programmed into the depth sounder to activate deep and shallow depth alarms.

CAUTION ! Do not stow metallic objects near the heading sensor as it may cause inaccurate compass readings.

F.6. ST60 Digital Compass

The ST60 digital compass (**Figure 3-41**) is mounted on the OHIP at centerline. The compass can display true/magnetic course headings, current or locked heading, course over ground, average heading, and a man overboard function. The compass is a stand-alone unit requiring a 10- to 16-VDC input. The heading sensor is located under the coxswain seat box.

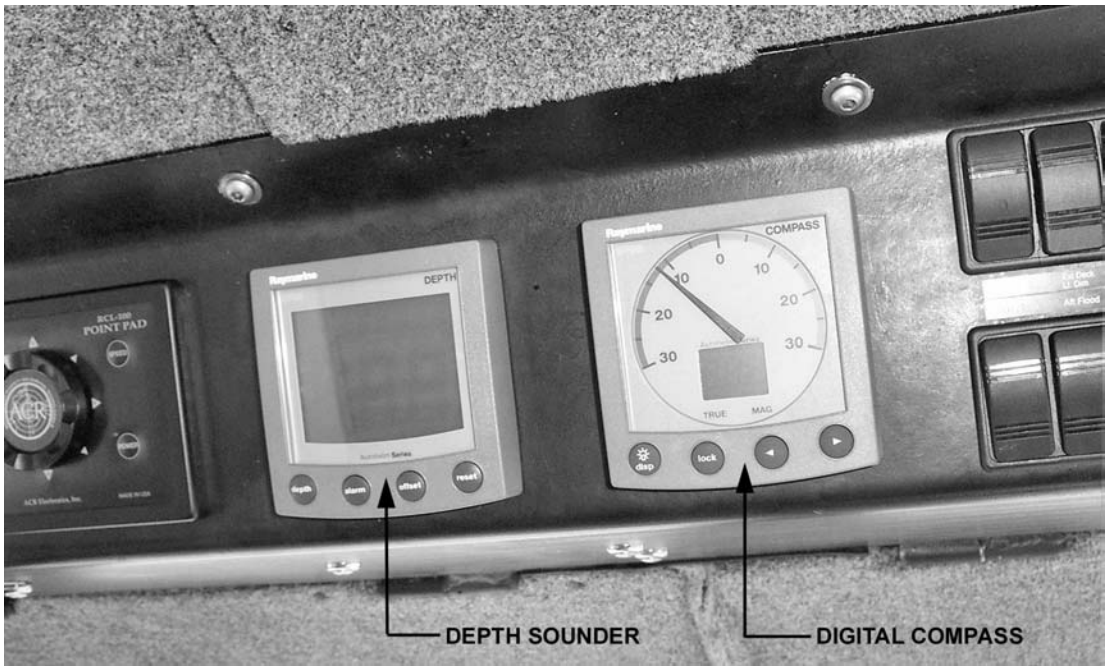


Figure 3-41
Depth Sounder and Digital Compass

F.7. Magnetic Compass

A Nexus magnetic compass (**Figure 3-42**) is mounted on the centerline between the cabin windshields. It is the standby or backup compass used for navigation. The compass contains an internal gimbal system for maximum stability during adverse weather conditions. Built-in compensators provide for easy compass deviation adjustments. The blue dial is calibrated in white 5-degree increment markings. Lubber lines are provided at 45 degrees.

NOTE

Magnetic compass deviation may occur when cabin electrical equipment (windshield wiper motors, cabin fan motors, or heater) is energized creating electro-magnetic interference (EMI).

Figure 3-42
Standby/Magnetic Compass

F.8. Antennas

All of the communications and navigation antennas (**Figure 3-43**) are mounted on the radar pod or on top of the cabin. The antennas and the radar pod can be lowered to allow for overhead clearance when the RB-HS is loaded on the trailer for air transport.

Figure 3-43
Antennas

Section G. Communications/Navigation System (RB-S)

Introduction

All of the standard marine communications and navigation equipment is mounted in the cabin of the RB-S. The RB-S utilizes a Scalable Integrated Navigation System (SINS) that is built around the Furuno NavNet radar/chart plotter system. The SINS system on the RB-S includes the following:

- 1933C/NT Radar/Video Plotter
- PG1000 Heading Sensor
- GP-37 WAAS/DGPS Navigator
- RD-30 Multi-Display Unit
- 235DT-SSE Depth Sensor

NOTE

Frequent operations and position reports between the boat and its operational control (OPCON) are critical to crew safety and timely mishap follow-up. Every boat must have the capability for communicating by radio to the station and other vessels. For radio protocol, channel selection, and additional radio communication information, refer to *Chapter 11* in the *Boat Crew Seamanship Manual,* COMDTINST M16114.5 (series); the *Telecommunications Manual*, COMDTINST M2000.3 (series); and the *Radiotelephone Handbook*, COMDTINST 2300.7 (series).

G.1. Raymarine 430 Loudhailer

The Raymarine 430 loudhailer (**Figure 3-44**) requires a 12-VDC input and provides 30 watts of output power to the loudhailer speaker on the forward face of the radar pod. The loudhailer has eight programmable foghorn signals to be used when operating in conditions of low visibility. The loudhailer and microphone are mounted on the port side of the dash panel.

G.2. Motorola VHF-FM Astro Spectra W9 Transceiver and Control Head

The Motorola VHF-FM Astro Spectra W9 transceiver and control head (**Figure 3-44**) is mounted in the cabin on top of the port dash panel. The transceiver is located on the portside behind the 12-VDC main power panel. The transceiver is used for communicating on VHF marine band frequencies, 146 to 174 MHz. The transceiver meets the digital encryption standard (DES) requirements for APCO 25. The radio requires a 12-VDC power input. The radio antenna is located atop the cabin, port side.

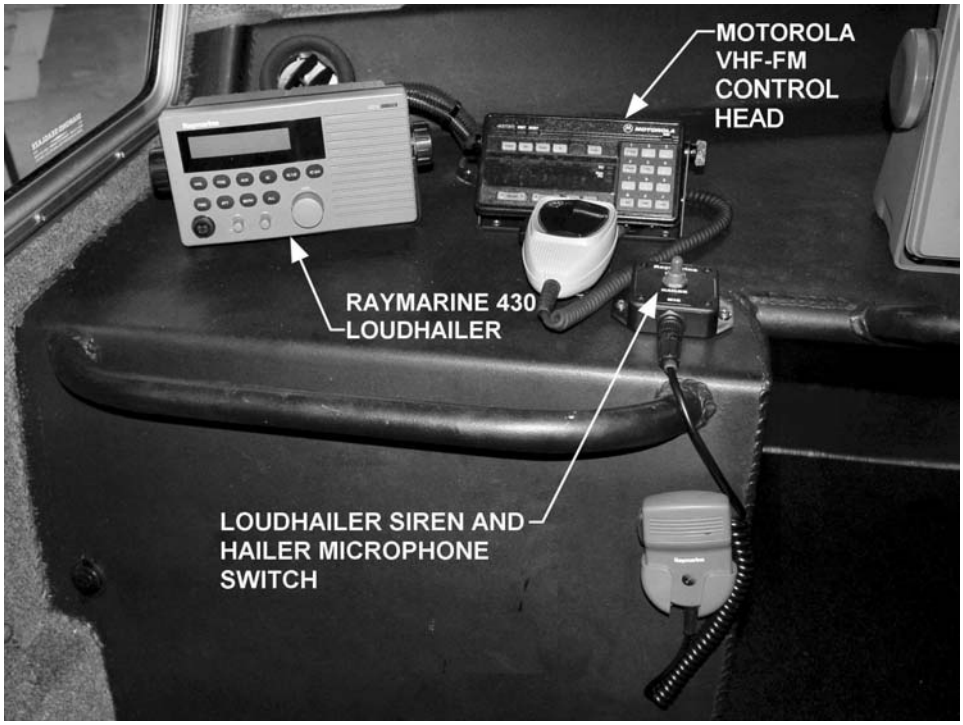


Figure 3-44
Raymarine 430 Loudhailer and Motorola VHF-FM Astro Spectra W9 Control Head

G.3. Raymarine 215 VHF Transceiver

The Raymarine 215 VHF transceiver (**Figure 3-45**) is a microprocessor controlled, digitally synthesized VHF transceiver. The transceiver provides two-way communications on marine channels and monitoring of 10 separate weather channels. The transceiver has built-in digital select calling (DSC) for sending and receiving DSC distress, all ships, individual ship, and group call communications. The radio requires 12-VDC input and has a 25- or 1-watt power setting. The antenna is located atop the cabin, starboard side. The transceiver can transmit on frequencies 156.025 to 157.425 MHz and receive on frequencies 156.050 to 163.275 MHz. The transceiver is located on the OHIP, port side.

Figure 3-45
Raymarine 215 VHF Transceiver

G.4. Furuno 1933C/NT Radar Display

The Furuno 1933C/NT radar display (**Figure 3-46**) is mounted on top of the dash panel on the centerline. This surface radar/chart plotter has a 10.4-inch color LC display and utilizes a powerful X-band transmitter for reliable operation in all types of weather. This true color radar displays six levels of target density and is capable of tracking storms. The radar incorporates head-up, course-up, north-up, and true motion display modes. The range scales are from 0.125 to 48 NM, 16-step increments. The Echo Trail intervals available are 15 seconds; 30 seconds; 1, 3, 6, 15, and 30 minutes; or continuous.

The plotter has a memory capacity of up to 8000 points for the boat's track and marks, 1000 waypoints, and 200 planned routes. Display modes include course plot, navigation data, steering display, and highway. Plot interval is adjustable from 1 second to 59 minutes, 59 seconds or 0.01 to 9.99 NM. Alarms available are guard zone, arrival/anchor watch, proximity alert, ships speed, water depth and temperature, and cross track error (XTE). A SAVE MOB function will immediately mark the MOB position and display the range and bearing of the man overboard location on the display.

Figure 3-46
Radar Display

G.5. Radome Antenna

The radar antenna (**Figure 3-47**) is a compact Furuno 4-kW radome antenna that has a maximum range of 36 NM. The radome requires a 12-VDC input.

G.6. WAAS/DGPS Receiver/ Antenna

The Furuno Wide Area Augmentation System (WAAS)/differential global positioning system (DGPS) receiver/antenna (**Figure 3-47**) is mounted on the radar pod. The antenna has 12 DGPS receiving channels and 1 WAAS receiving channel. The receiver/antenna can decode correction signals from WAAS/DGPS and provide these signals to the 1933C/NT radar display and the GP-37 WAAS/DGPS navigator. The position accuracy for the DGPS is 10 meters; the DGPS, 5 meters; and the WAAS, 3 meters. The receiver/antenna requires a 12-VDC input.

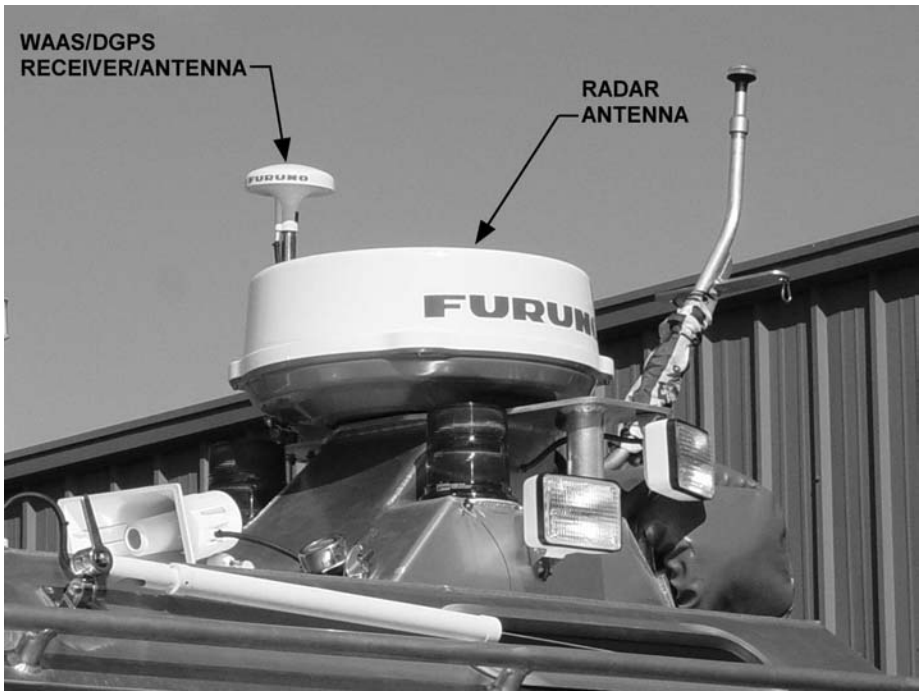


Figure 3-47
Radar Antenna and WAAS/DGPS Receiver/Antenna

G.7. RD-30 Multi-Display

The RD-30 multi-display and data repeater (**Figure 3-48**) is mounted on the starboard face of the coxswain's operating console. The RD-30 utilizes a wide variety of navigation data and displays it in digital and analog (graphic) formats. The multi-display uses input from the depth/temperature sensor, radar, WAAS/DGPS receiver/antenna, and the PG 1000 heading sensor to provide essential navigational information. The unit features a 4½-inch backlit LCD and has five user programmable displays. The RD-30 has ten conditions that can trigger audio and visual alarms:

- Speed
- Water temperature
- Depth
- Arrival/anchor watch
- XTE
- Trip distance (two alarms)
- Countdown timer
- Alarm clock
- No position fixing
- No position data

The RD-30 requires 12-VDC input.

NOTE

WAAS is not currently approved for use by Coast Guard vessels. In the AUTO mode, the GP-37 runs with DGPS as the default setting. If the DGPS signal is lost for any reason, the WAAS mode is automatically selected. Consult the Furuno Operator's Manual for the GP-37 DGPS Navigator to enable the AUTO mode from the Menu selection.

G.8. GP-37 WAAS/DGPS Receiver and Navigator

The GP-37 WAAS/DGPS receiver and navigator (**Figure 3-48**) is mounted on the port face of the coxswain's operating console. The GP-37 is totally integrated DGPS receiver and video plotter. The GP-37 can track up to 13 satellites (12 DGPS, 1 WAAS) simultaneously using the WAAS/DGPS receiver/antenna mounted on the radar pod.

Display modes available are: plotter, NavData (position indication in latitude, longitude or LORAN), steering (vessel course, position, speed), and highway. The GP-37 has five available alarm functions and a memory capacity of 1000 points of vessel track, 999 waypoints or marks, and 50 routes comprised of up to 30 waypoints. The GP-37 has an accuracy of 5 meters or better with DGPS and 3 meters or better with WAAS. The GP-37 requires a 12-VDC power source.

CAUTION ! Magnetic compass deviation may occur when cabin electrical equipment (windshield wiper motors, cabin fan motors, or heater) is energized creating EMI.

G.9. Magnetic Compass

A Ritchie magnetic compass (**Figure 3-48**) is mounted on the starboard dash panel, centered over the coxswain console. It is the standby or backup compass used for navigation. The compass contains an internal gimbal system for maximum stability during adverse weather conditions. Built-in compensators provide for easy compass deviation adjustments. The blue dial is calibrated in white 5-degree increment markings. Lubber lines are provided at 45 degrees.

Figure 3-48
Coxswain Console

G.10. PG-1000 Heading Sensor

The heading sensor (**Figure 3-49**) is mounted horizontally inside the cabin on the centerline, aft bulkhead under the step. The sensor detects terrestrial magnetism and produces heading data, which can be utilized by navigation system component s that need accurate and stable heading input. The heading accuracy of the sensor is ±1 degree. The compass sensor requires a 12-VDC power source.

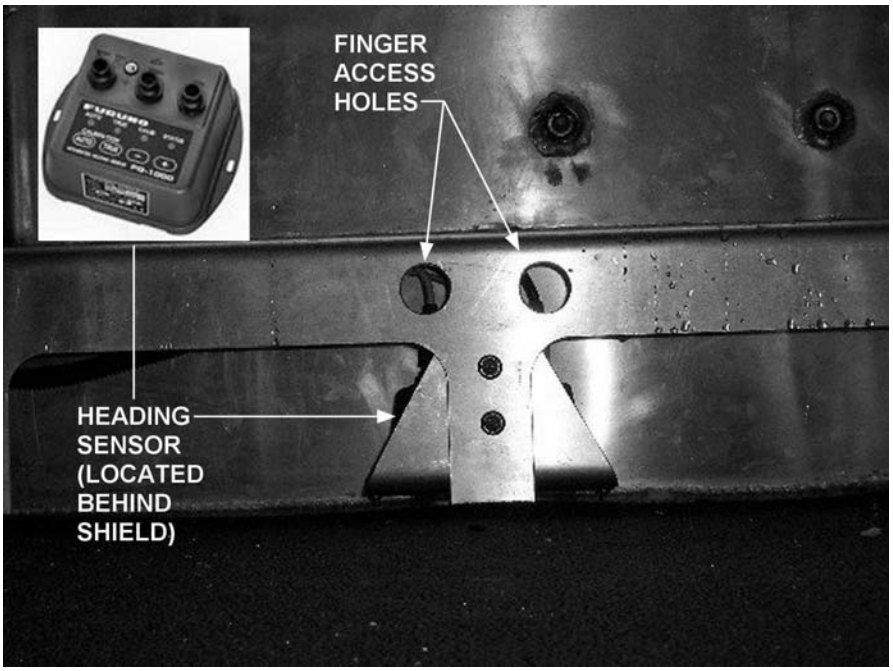


Figure 3-49
Heading Sensor

G.11. 235DT-SSE Depth and Temperature Sensor

The 235DT-SSE depth and temperature sensor (**Figure 3-50**) is mounted under the transom, on the centerline, aft of the step. The RD-30 multi-display has programmable alarm set-points and menu selectable displays for water temperature and depth that require input from the 235DT-SSE sensor.

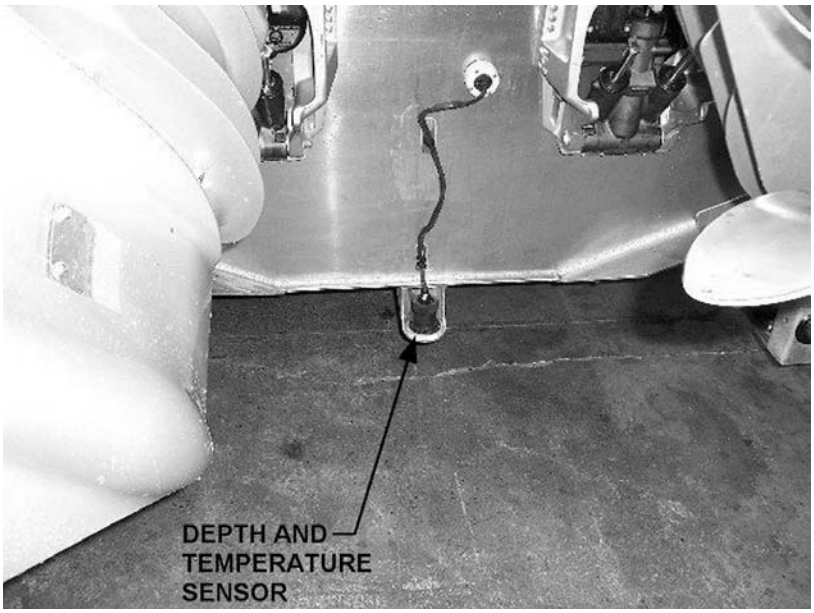


Figure 3-50
Depth and Temperature Sensor

G.12. Antennas All of the communications and navigation antennas (**Figure 3-51**) are mounted on the radar pod or on top of the cabin. The antennas and the radar pod can be lowered to allow for overhead clearance when the boat is loaded on the trailer for air transport.

Figure 3-51
Antennas (RB-S)

Section H. Electrical System

Introduction

The electrical system consists primarily of two engine-driven alternators, two starting batteries, one accessory battery, and control devices and indicators.

H.1. Alternators

Two alternators provide the charging power for the boats' batteries. Each alternator is rated at 12 VDC, 60 amps at 2300 RPM, and can produce 48 amps of power at an engine speed of 1000 RPM. Each alternator is belt-driven and mounted on the outboard engine driveshaft. An indicator light, located on the engine switch key panel, will illuminate if the charging system is faulty. Each engine has a voltmeter (**Figure 3-52**) on the OHIP to indicate alternator output.

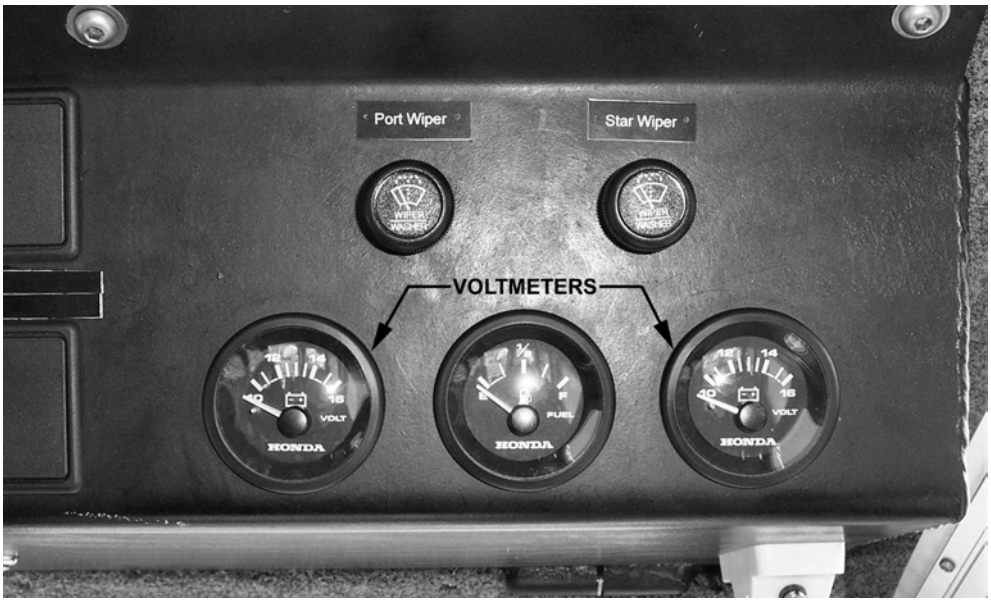


Figure 3-52
Voltmeters

CAUTION ! If the 12-VDC power supplies trip off-line, secure the electronics and allow power supplies to cool. Visually check the individual or the main 75-amp breaker to see if it has tripped. Isolate the circuit (breaker off/open) until the system can be serviced.

H.2. Batteries

The boats' batteries (**Figure 3-53** (RB-HS), **Figure 3-54** (RB-S)) consist of three 12-V gel-cell type batteries mounted on the port side under the forward crew seat. On the RB-S, a sliding battery tray (**Figure 3-54**) has been incorporated to provide battery accessibility for maintenance. On both boats, the batteries are vented (**Figure 3-55** (RB-HS), **Figure 3-56** (RB-S)) to the exterior, port aft cabin bulkhead to prevent accumulation of charging gases. One additional battery vent is installed on the RB-S on the forward port cabin exterior bulkhead just aft of the heater exhaust.

Figure 3-53
Batteries (RB-HS)

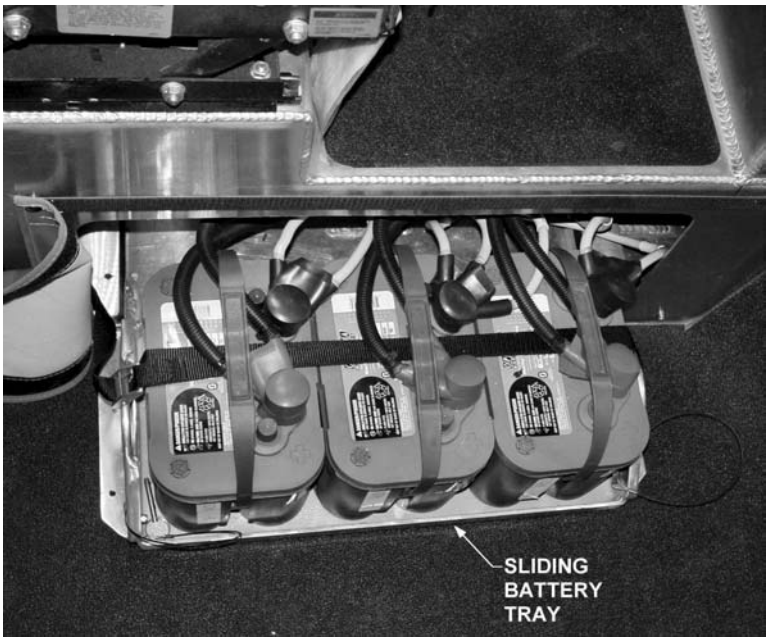


Figure 3-54
Batteries (RB-S)

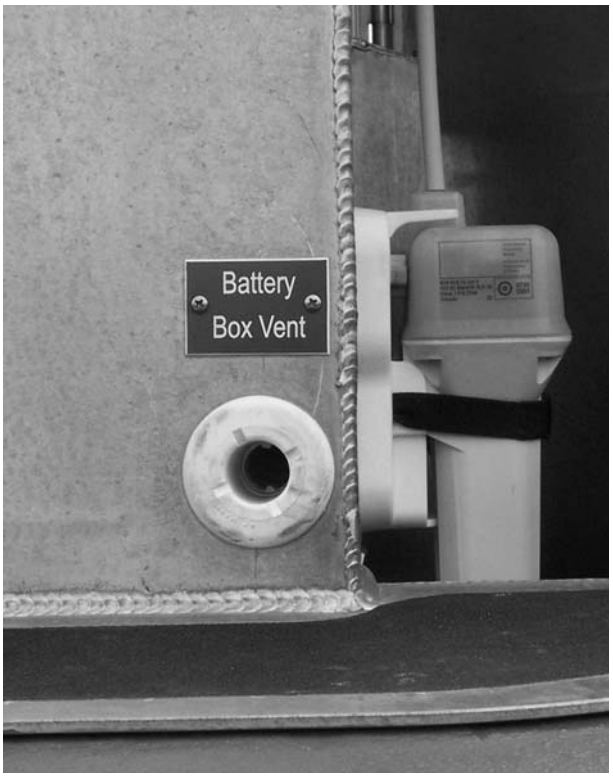


Figure 3-55
Battery Box Vent (RB-HS)

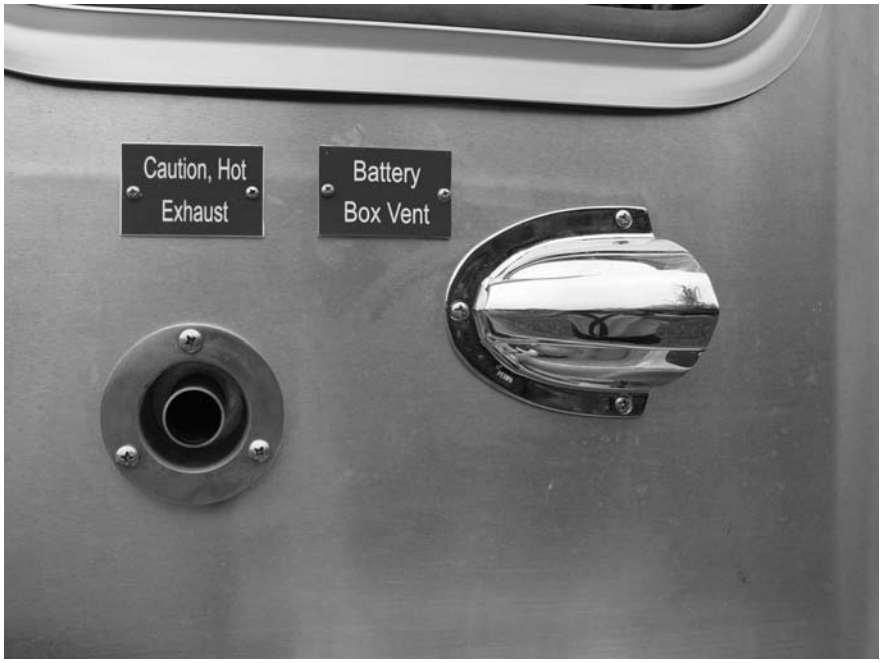


Figure 3-56
Forward Battery Vent (RB-S)

H.3. Battery Switches

The battery disconnect switches and battery interconnect switch are mounted on the 12-VDC main power panel (**Figure 3-57**) located inside the cuddy cabin, port side. The panel has switches labeled as follows:

- PORT BATTERY
- STARBOARD BATTERY
- ELECTRONICS BATTERY
- INTERCONNECT FOR EMERGENCY USE ONLY

Under normal circumstances, the port and starboard batteries are operated independently for engine starting. However, if the individual battery fails to start the engine, the interconnect switch will parallel the two starting batteries.

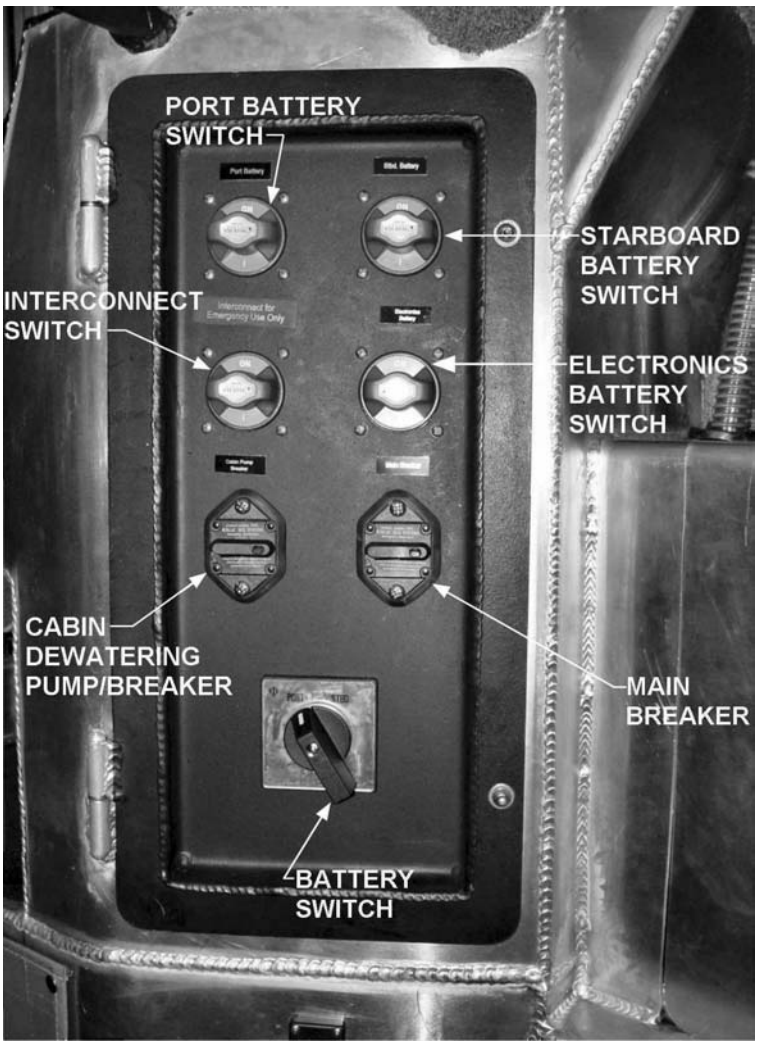


Figure 3-57
12-VDC Main Power Panel

H.3.a. Battery Isolator	The electronics battery is protected from over-charging by the use of an installed battery isolator.
H.3.b. Circuit Overload Protection	The 12-VDC main power panel (**Figure 3-57**) also incorporates a 75-amp breaker for circuit overload protection and a breaker for the electric cabin dewatering pump/breaker.

H.4. 12-VDC Distribution Panels

Three 12-VDC distribution panels (**Figure 3-58**) are located on the inboard side of the starboard cabin console. The panels provide circuit protection for shipboard electrical and electronic equipment. Listed below are the components served by each console on the RB-HS and RB-S:

RB-HS		
Top Panel	**Middle Panel**	**Bottom Panel**
Radar	Navigation lights	Heater
VHF radio (Raymarine)	Instruments lights	Cabin fans
VHF radio (Motorola)	Floodlights	Windshield wipers
Loudhailer	Searchlights	Horn
Four spare breakers	Deck lights	12-VDC outlets
	Cabin lights	*Two spare breakers*
	One spare breaker	

RB-S		
Top Panel	**Middle Panel**	**Bottom Panel**
Radar	Navigation lights	Heater
DGPS	Instrument lights	Cabin fans
Depth sounder	Floodlights	Windshield wipers
VHF 1	Strobe light	Horn
VHF 2	Searchlights	12-VDC outlets
Loudhailer	Deck lights	*Three spare breakers*
Two spare breakers	Cabin lights	
	One spare breaker	

Figure 3-58
12-VDC Distribution Panels

H.5. Ground

A two-wire insulated return (ungrounded) 12-VDC system is used so that all grounds from electronic equipment are run back to the battery and are not grounded to the hull.

Section I. Seating System (RB-HS)

Introduction

Two suspension-mounted seats are located at the port and starboard console. Bench seating is provided in the aft portion of the main cabin as well as in the cuddy cabin.

I.1. Seats

The two suspension-mounted seats (**Figure 3-59**) have an overall width of 24 inches and a height adjustment of 3 inches. There is a 6-inch forward and aft double-locking slide adjustment via a handle on the lower left portion of the seat. The backrest is adjustable and the armrests fold up to allow easy access. The seat back is contoured for lumbar support. The base is made of mild steel with steel fasteners. The base is equipped with a heavy-duty adjustable shock absorber designed for severe duty.

The bench seats are marine grade vinyl covered foam. The removable cushions are fastened with heavy-duty Velcro and the permanent cushions have a marine grade plastic incorporated to accommodate fastening screws.

NOTE

Regular maintenance of the seats must be performed in accordance with PMS to ensure proper operation.

Figure 3-59
Forward Cabin Seat (RB-HS)

Section J. Seating System (RB-S)

Introduction

Two shock mitigating, suspension-mounted seats are located forward in the cabin just aft of the port and starboard operating consoles. Two shock absorbing seats are located inside the cabin, aft, port and starboard side. A padded bench seat is also located in the cabin. All interior cabin seats are equipped with seat belts.

J.1. Forward Cabin Seats

The two forward cabin seats (**Figure 3-60**) have an overall width of 24 inches and a height adjustment of three inches. There is a six-inch forward and aft double locking slide adjustment via a handle on the lower left portion of the seat. The backrest is adjustable and the armrests fold up for easy access. The seat back is contoured for lumbar support. The base is made of mild steel with steel fasteners. The base is equipped with a heavy-duty adjustable shock absorber and is designed for severe duty.

Figure 3-60
Forward Cabin Seats (RB-S)

J.2. Aft Cabin Seats

The two aft cabin seats (**Figure 3-61**) are marine grade vinyl covered foam with mechanical, spring-loaded, shock mitigating adjustments (**Figure 3-62**) for the back of the seats. A stowage bag for the inboard seat belt section is provided on both aft seats.

NOTE

Regular maintenance of the seats must be performed in accordance with PMS to ensure proper operation.

Figure 3-61
Aft Cabin Seat (RB-S)

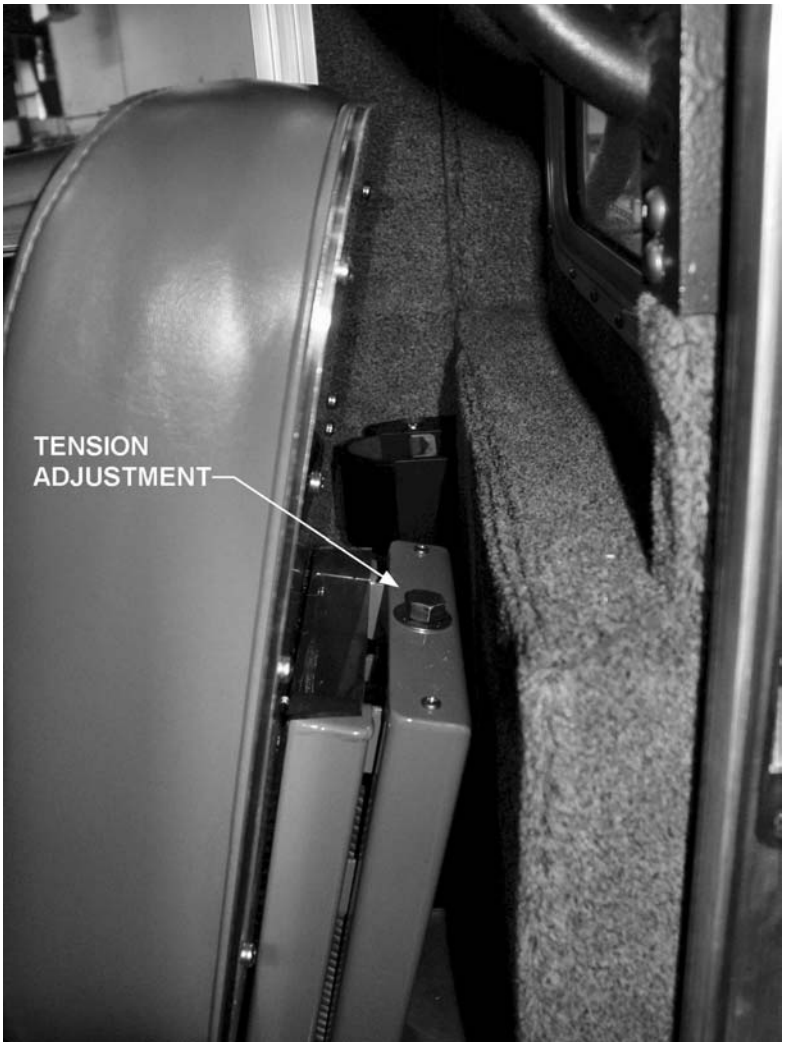


Figure 3-62
Rear Seat Back Tension Adjustment

Section K. Heating System

Introduction

The cabin of Defender Class boats is heated by a 12,000-BTU combustion heater. The heated air is also used for defrosting or defogging the windshield.

K.1. Heater

A 12,000-BTU combustion heater that utilizes diesel fuel is located inside the cabin, port side behind an access panel. The heater draws air from outside combustion (25%) and mixes it with cabin air (75%). The heater intake (**Figure 3-63** (RB-HS), **Figure 3-64** (RB-S)) is located on the port cabin exterior bulkhead, below the windshield. The heater incorporates an internal electric fan for air circulation, a self-contained ignition system for igniting the fuel, and a fuel pump.

Heater exhaust air is discharged from an opening on the port exterior cabin bulkhead (**Figure 3-65** (RB-HS), (**Figure 3-64** (RB-S)).

Figure 3-63
Heater Intake (RB-HS)

Figure 3-64
Heater Intake and Exhaust (RB-S)

Figure 3-65
Heater Exhaust (RB-HS)

K.2. 30-Amp Breaker

A 30-amp breaker connects the heater to the 12-VDC electrical system.

K.3. Thermostat

The thermostat and ON-OFF switch (**Figure 3-66**) for the heater is located on the starboard dash panel, inboard and below the steering wheel.

NOTE

To shut down the heater, turn temperature control to minimum, operate for two minutes, depress ON-OFF rocker switch in the *off* position.

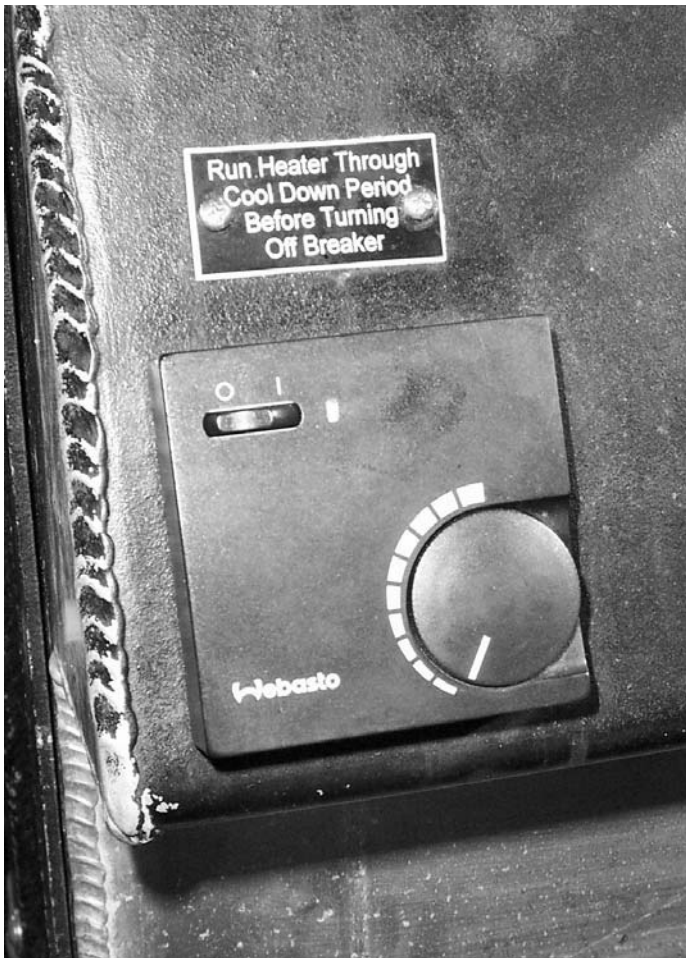


Figure 3-66
Heater Thermostat

K.4. Diesel Fuel Tank

On the RB-HS, a six-gallon diesel fuel tank (**Figure 3-67**) is located on the aft weather deck, just aft of the port cabin bulkhead. On the RB-S, the diesel fuel tank (**Figure 3-68**) is located inside the starboard aft deck locker. On both boats, an in-line fuel filter is located between the fuel tank and heater.

Figure 3-67
Heater Diesel Fuel Tank (RB-HS)

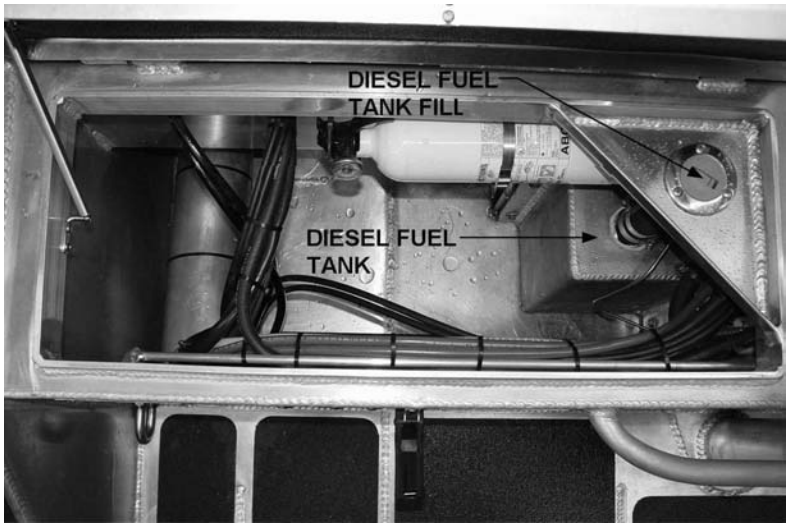


Figure 3-68
Heater Diesel Fuel Tank (RB-S)

K.5. Window Defrosters

Window defrosters (**Figure 3-69**) are located atop the dash panel in the forward outboard corners.

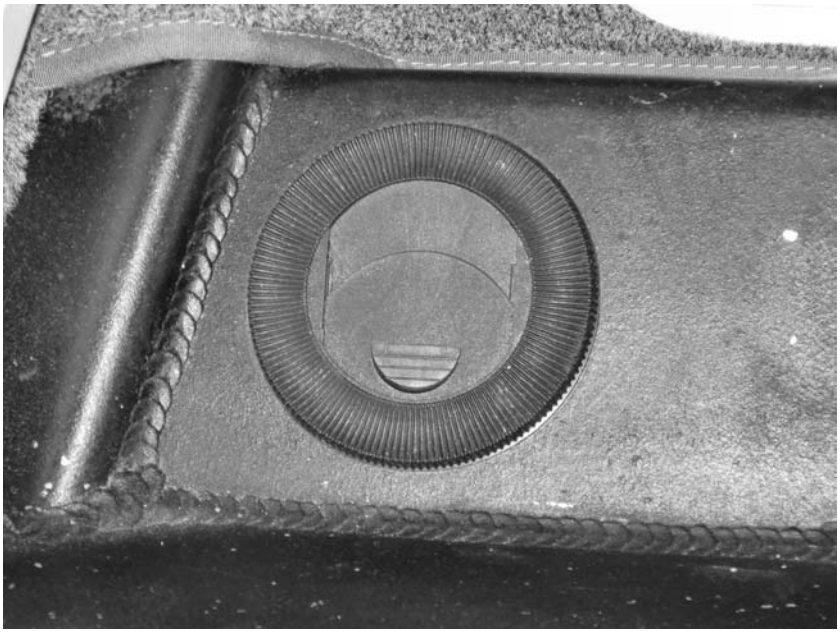


Figure 3-69
Window Defroster

Section L. Trailering

The trailer (**Figure 3-70**) that accompanies Defender Class boats is custom built by E-Z Loader. It is designed to transport the RB-HS **(Figure 3-71)** and RB-S **(Figure 3-72)** on roadways and allows the trailer and boat to be loaded onto a HC-130 aircraft for worldwide deployment.

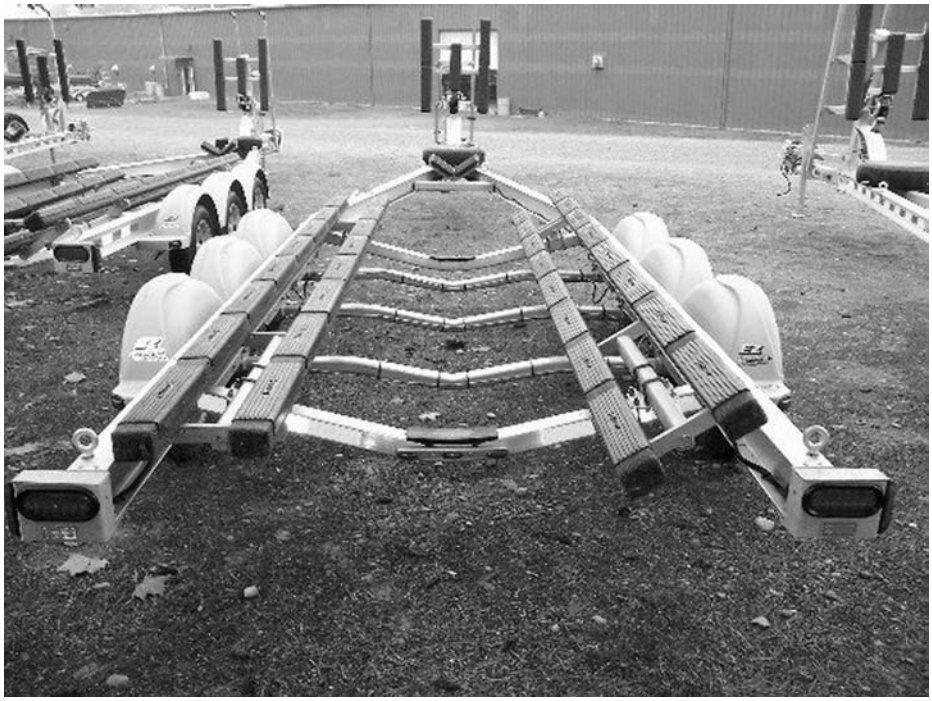


Figure 3-70
Boat Trailer

L.1 General

Your boat trailer and associated equipment are an important part of your boat's equipment. All too often, the trailer and tow vehicle do not receive the attention required to ensure proper operation. Proper maintenance and continual care of all trailering equipment is necessary.

NOTE

The only trailer authorized for the Defender Class Boat is the EZ Loader Trailer designed for this class of boat.

WARNING

If care and maintenance of the trailer is neglected, you may be endangering the safety of your boat, your vehicle, your crew, yourself and the public.

Figure 3-71
RB-HS and Trailer

Figure 3-72
RB-S and Trailer

L.2 Tow Vehicle

The tow vehicle must be capable of handling the weight of the trailer (with boat and equipment), as well as the weight of the passengers and equipment carried inside the vehicle. This may require that the tow vehicle be specially equipped with the following:

- Engine of adequate power.
- Transmission and rear-end designed for towing.
- Larger cooling systems for the engine and transmission.
- Heavy-duty brakes.
- Load bearing hitch attached to the frame, not the bumper.

NOTE The vehicle's towing limitations can be found in the owner's manual.

L.3 Hitch

The trailer hitch is attached to the tow vehicle's frame providing a secure fitting from which to attach the receiver and ball mount.

The Hitch shall be at a minimum a Class V hitch capable of carrying 10,000 lbs or greater. The hitch **must** be stamped or have a sticker from the manufacturer stating type of hitch and the rated weight greater than 10,000 lbs.

L.4 Receiver/ Ball Mount and Ball

The receiver/ball mount attaches to the trailer hitch providing a secure fitting to mount the trailer ball.

The ball mount must be capable of carrying trailer weight of 10,000 lbs or greater. The ball mount **must** be stamped or have a sticker from the manufacturer stating type of hitch and the rated weight greater than 10,000 lbs.

The ball **must** be a 2 5/16" Class V rating of at least 10,000 lbs. It shall be stamped and **clearly** legible. The ball should be kept free of rust and inspected often for cracks and abnormal wear. **(Figure 3-73)**

Figure 3-73
Hitch, Receiver, Ball Mount and Ball Assembly

L.5 Trailer Coupler, Safety Chains and Hydraulic Brake Actuator

The trailer coupler attaches to the ball of the tow vehicle. The coupler engages the ball and provides a positive mechanical lock between the trailer and the tow vehicle. The coupler **must** be a 2 5/16" Class V rating of at least 10,000 lbs. It shall be stamped and **clearly** legible.

Two safety chains attached to the trailer provide trailer retention to the vehicle should the coupler disengage from the ball. The safety chains **must** be ½" galvanized steel. One end of the safety chains are bolted directly to the trailer with the other attached to the tow vehicle's hitch with ½" galvanized screw pin shackles that are rated at 2 tons.

The breakaway lever actuating chain is attached to the towing vehicle's hitch during trailering operations. Should the trailer break away from the towing vehicle, the breakaway lever actuating chain will be pulled forward, which will automatically apply the trailer's brakes. The breakaway lever actuator safety chain **must** be attached to the hitch using ¼" shackle and an additional ½" shackle. The breakaway lever actuating chain is a standard length and should not be altered in any way. **(Figure 3-74)**

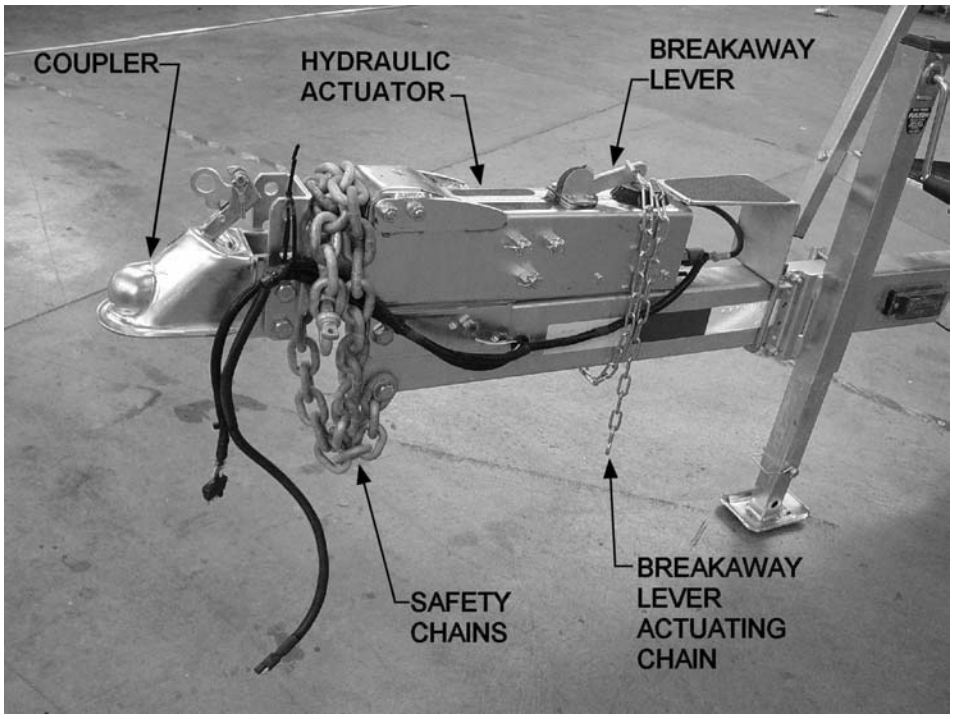


Figure 3-74
Trailer Coupling Assembly

NOTE

Always use a designated "spotter" when hooking up the trailer. The spotter can provide detailed instructions to the tow vehicle operator when backing up which will prevent damage to both the tow vehicle and trailer.

L.6 Trailer Construction and Equipment

The primary frame of the trailer is made up of 4 X 6-inch aluminum "I"-beams. The suspension is a torsion axle system. The trailer is a six-wheel configuration (three on each side) with one spare and an E-Z Jack. The wheels are attached to the hub system.

The RB-HS uses conventional incandescent bulbs for trailer brake, tail, and clearance lights. The RB-S uses LEDs for trailer brake, tail, and clearance lights.

The E-Z Jack was designed as an easy-to-use, safe, and reliable device for changing tires on tandem axle trailers. Its unique rocker shape allows trailer operators to simply drive the trailer onto the E-Z Jack to elevate entire trailer side of the tire to be changed.

L.7 Hooking up the Trailer

When hooking the tow vehicle up to the trailer, the same procedures should be done every time. Whether your transiting to a local boat ramp just down the road or going on a long trip, the trailer should always be completely attached to the tow vehicle. **(Figure 3-75)**

Follow these steps for attaching the trailer to the tow vehicle:

Step	Procedure
1	Using a spotter, carefully back the tow vehicle so that the trailer ball is aligned under the trailer's coupler.
2	Using the hand-crank jack, lower the trailer coupler until it is completely seated on the trailer ball.
3	Engage the coupler latch and insert the coupler latch pin to ensure it does not come undone during transit. NOTE: The coupler latch pin should have a lanyard long enough to facilitate insertion and removal.
4	Attach the safety chains. They shall be crisscrossed and have enough slack to allow for sharp turns in both directions yet short enough to not drag on the ground.
5	Attach the breakaway lever actuating chain to the hitch ensuring there is enough slack to allow for sharp turns in both directions.
6	Connect the wiring harness to the tow vehicle. The wiring harness (pig tail) should have enough slack to allow sharp turns in both directions and short enough as to not drag on the ground.
7	Check trailer lights to ensure they are operating properly.

NOTE The wiring on the trailer's wiring harness should be a 7-4-2 configuration.

CAUTION ! Once connected to the tow vehicle, ensure the trailer is being towed level to the ground. If the trailer is not level to the ground, a drop bar/ball mount of a different height may be necessary and/or the trailer coupler may need adjustment.

WARNING

Do not exceed the maximum weight rating on the trailer. Exceeding the maximum rating voids the manufacturer's warranty and may lead to failure of the trailer causing damage to the boat and creating an unsafe towing condition.

Figure 3-75
Trailer Hook-Up

L.8 Securing the Boat to the Trailer

Before taking the trailer and boat into tow, you must first ensure that the boat is properly secured to the trailer. **Damage to the boat and trailer could result if the two are not connected.**

Tie-down straps must be attached and tightened between the pad-eyes found on the boat and trailer prior to transporting the boat. Placement is as follows:

- One on each side of the transom **(Figure 3-76),**
- One on each side forward **(Figure 3-77)**,
- Below the fore deck and
- A strap attaching the trailer eyebolt to the trailer **(Figure 3-78)**.

Tie-downs shall be rated for at least 6,000 lbs., and be the same style and model as the issued tie-downs that came with the EZ Loader Trailer.

The bow of the RB-S / HS should remain 1 to 2 inches away from the bow stops when properly trailered. **(Figure 3-79)**

The winch strap shall not be used as a tie down and not exceed light strain.

The RB-S is outfitted with a window guard/screen, and should be in place for highway traveling.

NOTE In addition to the normal tie-down straps, the RB-S uses a belly strap amidships.

NOTE Trailer chaffing skids or "Bunk" must be kept in good condition to prevent scratching and gouging of the hull.

Figure 3-76
Trailer to Transom Tie Down

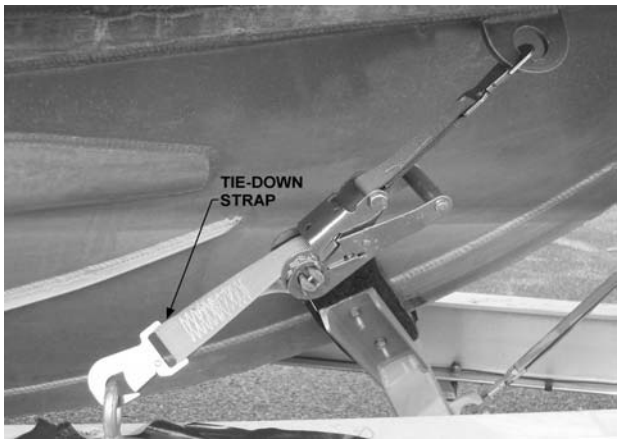


Figure 3-77
Boat Trailer, Bow Tie Down

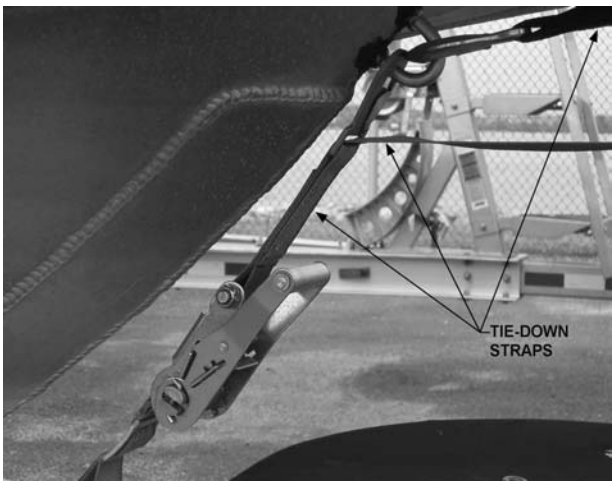


Figure 3-78
Boat Trailer, Forward Tie Down

(Figure 3-79)
Spacing Between Bow and Bow Stops

L.9 Towing Precautions

Pulling a trailer presents several problems: more time is required to brake, accelerate, pass, and stop. The turning radius is also much greater; curbs and roadside barriers must be given a wide berth when negotiating corners.

Prior to operating on the open road, the vehicle operator should practice turning, backing up, and other maneuvers on a level, uncongested parking area. Backing a trailer is a challenge even to the most experienced drivers and requires considerable practice.

NOTE

Many units require tow vehicle operators to complete a unit generated Performance Qualification Standard (PQS) before they tow a trailer.

L.10 Trailering Checklist

Before your trip, ensure the following items have been checked:

- Check intended routes for restrictions on bridges and tunnels, and low overhead clearances. All antennas and the anchor light mast should be rotated to the down position. With the antennas and the anchor light mast in the down position, the highest point of the trailered boat becomes the top of the radar pod, at 10 feet 8.5 inches above the ground.
- Ensure the tow ball and coupler are the same size and bolts with washers are tightly secured. (The vibration of road travel can loosen them.)
- Confirm the coupler is completely over the ball and the latching mechanism is locked down and secured with locking pin.
- Ensure the safety chains are securely attached, crisscrossing under the coupler, to the frame of the tow vehicle. If the ball were to break, the trailer's tongue would be held up by the chains allowing the trailer to follow in a straight line and prevent the coupler from dragging on the road.
- Ensure the breakaway lever actuating chain is attached to the hitch.
- Ensure the jack is fully cranked up.
- The side-view mirrors of towing vehicles should be large enough and adjusted to provide an unobstructed rear view on both sides of the vehicle.
- Check all the lights and signals on the trailer to ensure they function properly. When trailer lights are submerged during launching/recovery they have a greater chance of failure and should be serviced more frequently.
- Check the brakes. Lightly test before getting on a major road. On a level parking area, roll forward and apply the brakes several times at increased speeds to determine a safe stopping distance.
- Check tires (including spare) and wheel bearings. Improper inflation may cause difficulty in steering. Read the tire sidewall to determine tire pressure required. Also check for tire wear, cracks, bubbles, or foreign objects imbedded in the tire. The factory trailer is provided with bias ply tires that are not designed for speeds in excess of 65 mph. When trailer wheels are immersed in water (especially salt water) the bearings should be inspected and greased on a regular basis in accordance with PMS procedures.

WARNING

The factory trailer is provided with bias ply tires that are not designed for speeds in excess of 65 mph. However, because of the size and weight of the boat and trailer, drivers are cautioned to travel at speeds less than 55 mph.

- Check all spaces for standing water (rainwater or water from cleaning). Standing water is undesirable for many reasons, but mainly because a collection of it can rapidly increase weight on the trailer, often beyond its capacity. Furthermore, the extra weight may shift with the movement of the trailer and cause a dangerous situation.
- Ensure the trailer is loaded evenly from front to rear as well as side-to-side. Too much weight on the hitch will cause the rear of the tow vehicle to sag and may make steering more difficult. This can also cause your headlights to shine into the eyes of oncoming traffic.

L.11. Launching the Boat

Once at the boat ramp, use the following procedures to launch the boat:

Step	Procedure
1	Using a spotter, carefully back the trailer down the boat ramp to the water's edge.
2	Remove all of the tie-down straps that secure the boat to the trailer except for the strap attaching the trailer eyebolt to the trailer and the winch connection.
3	Visually inspect the boat's hull and engines for any damage that may have occurred during transit.
4	Place crew onboard the boat and have crew member stand-by to release the trailer winch connection.
5	Carefully back the trailer into the water until approximately three-quarters of the boat is floating free of the trailer.
6	Check spaces for flooding.
7	Lower engines into the water and start. Ensure the water level in the vicinity of the out drives is sufficient for operation and clear of hazards.
8	If crew is satisfied with condition of boat/engines and is ready to get underway, release the strap attaching the trailer eyebolt to the trailer and the winch connection and carefully push/power the boat back off the trailer.
9	Carefully pull tow vehicle forward clear of boat ramp.

NOTE After launching or recovering the boat, always rinse down the trailer with fresh water and check the trailer lights for proper operation.

CAUTION ! During recovery, ensure 1 to 2 inches of space remains between the bow and the bow stops. This will ensure proper loading and weight distribution.

CAUTION ! **Always use a spotter when backing a trailer!** Windows should be open and radio should be off.

L.12 Recovering the Boat

When finished with boat operations, use the following procedures to recover the boat:

Step	Procedure
1	Using a spotter, carefully back trailer down the ramp until approximately three-quarters of the trailer is submerged.
2	Align the center of the boat with the center of the trailer and carefully maneuver the boat onto the trailer. **Check water level in the vicinity of the trailer and trim engines up or secure as needed.**
3	Attach trailer winch to bow of boat and pull boat forward onto the trailer until 1 to 2 inches of space remains between the bow and the bow stops. **Always ensure boat stays centered on trailer.**
4	Attach strap from the trailer to trailer eyebolt.
5	Secure engines on boat (if still running).
6	Slowly pull the tow vehicle forward until the trailer is clear of the water.
7	Attach all tie-down straps securing the boat to the trailer.
8	Connect trailer-wiring harness to tow vehicle and ensure lights are operating properly.
9	Do a complete visual inspection of the tow vehicle, trailer, and boat before transiting on highway.

Section M. Weapons Mounting/Stowage

Introduction

The fore and aft tow bitts on Defender Class boats are designed to provide the foundation for and accommodate the MK 16 MOD 8 stand for a weapons system to be determined by Commandant (G-O).

NOTE

Weapons allowances for Coast Guard boats are established by G-OCU.

M.1. Pedestal Stands

The MK 16 MOD 8 stands may be mounted on the forward and aft tow bitts. The stands can receive various weapons and are equipped with stops to prevent discharging the weapon toward the hull.

M.2. Ammunition Stowage

Ready service ammunition for the forward gunner is stowed in the anchor locker depicted in **Figure 3-77**. Ready service ammunition for the aft gunner is stowed in the cabin.

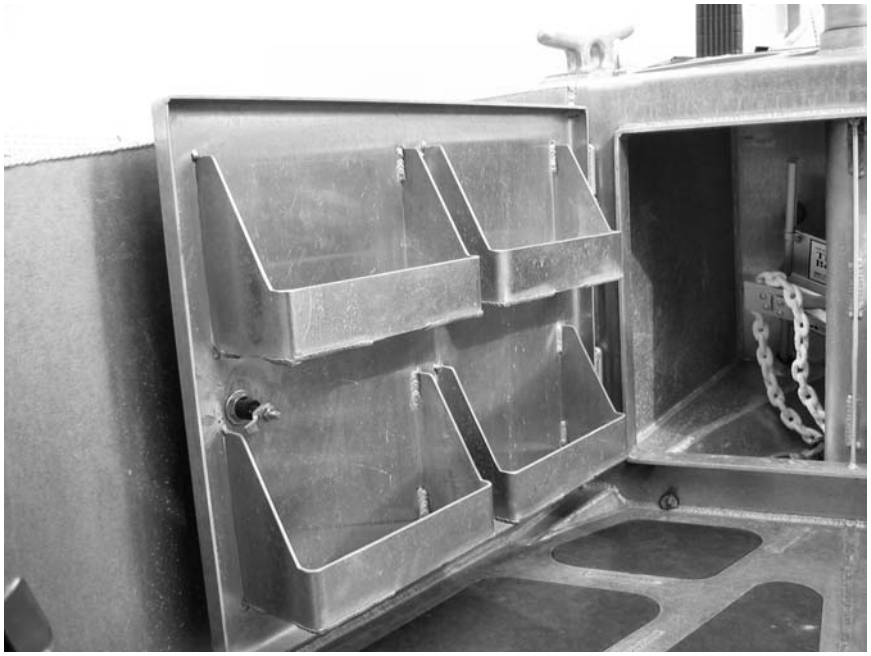


Figure 3-77
Ammunition Stowage

M.3. Weapon Locks/Mounts

On the RB-HS, secure, lockable mounts (**Figure 3-78**) for the Coast Guard modified 12-gauge shotgun and M16 rifle are provided on bulkheads inside the aft cabin. The RB-S utilizes Santa Cruz electrically-operated weapon locks/mounts (**Figure 3-79**) with backup key override.

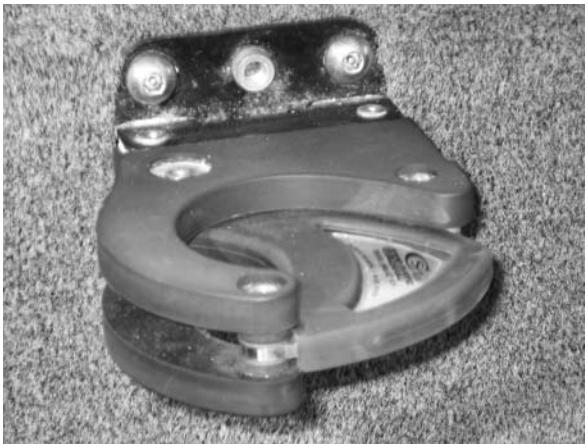


Figure 3-78
Weapon Lock/Mount (RB-HS)

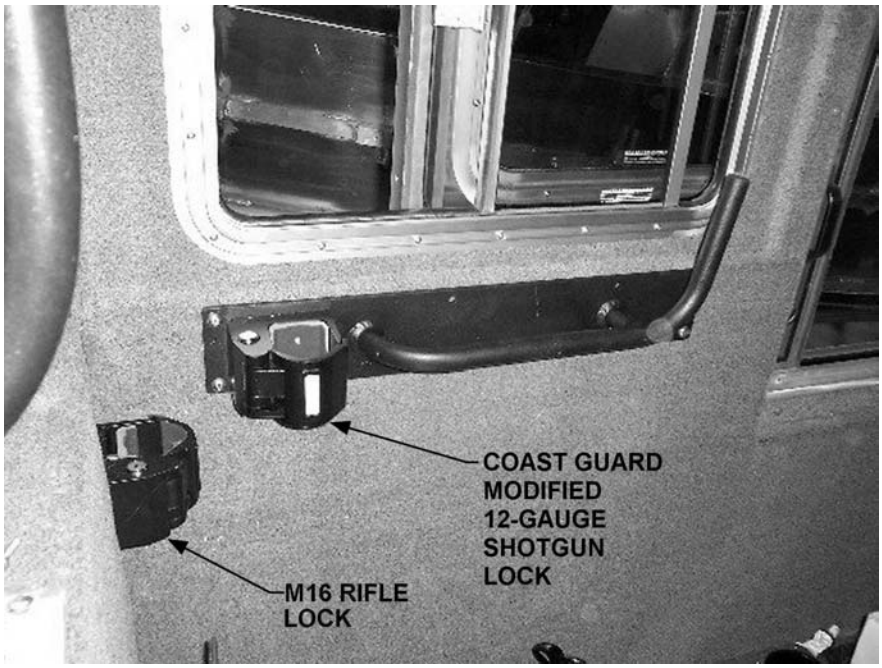


Figure 3-79
Weapon Locks/Mounts (RB-S)

Section N. Hull Exterior Lighting (RB-HS)

Introduction

The RB-HS is equipped with exterior lighting to comply with international marine operating requirements for specific mission operations and crew safety.

N.1. Searchlight

The searchlight (**Figure 3-80**) is mounted on the centerline atop the cabin and is controlled by a remote control panel (**Figure 3-81**) mounted on the OHIP. The searchlight is rated at 200,000 candlepower and can be rotated 360 degrees. The beam can be elevated 9 degrees up and 17 degrees down.

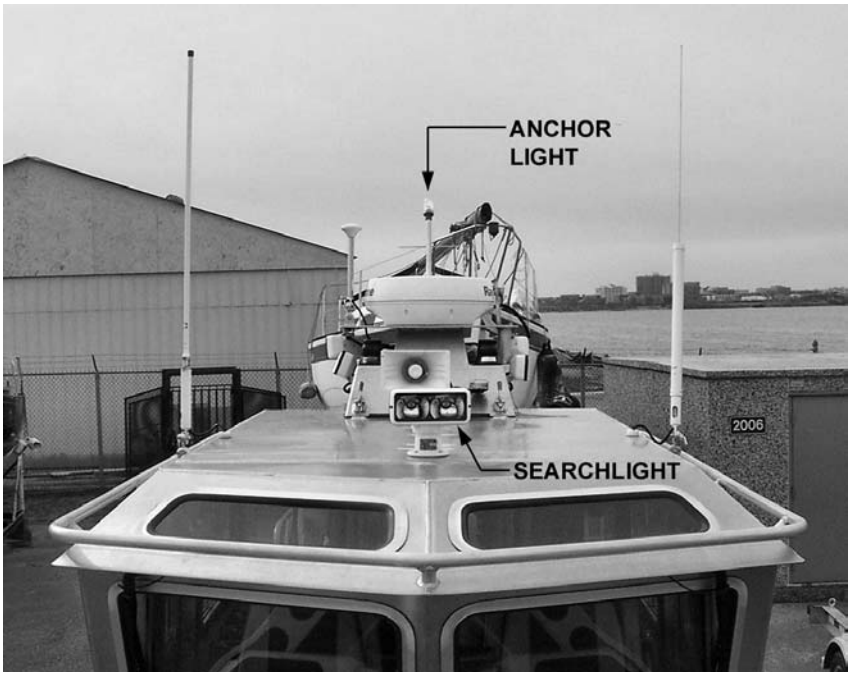


Figure 3-80
Searchlight (RB-HS)

Figure 3-81
Searchlight Control (RB-HS)

N.2. Light Switch Panel

The light switch panel (**Figure 3-82**) is located on the approximate centerline of the OHIP. The following lights are controlled from the light switch panel:

Port (red) navigation light (**Figure 3-83**)	Port forward on upper cabin bulkhead
Starboard (green) navigation light	Starboard forward on upper cabin bulkhead
Anchor light (white) (**Figure 3-80**)	Atop the radar pod
Port and starboard floodlights (**Figure 3-84**)	Port and starboard on the side of radar pod
Aft floodlights (**Figure 3-84**)	Aft port and starboard on the aft frame of radar pod
Exterior (deck edge) lights (**Figure 3-85**)	Exterior cabin bulkhead, port and starboard, outboard along the deck edge
Law enforcement lights (2) (blue)	Atop the radar pod, port and starboard

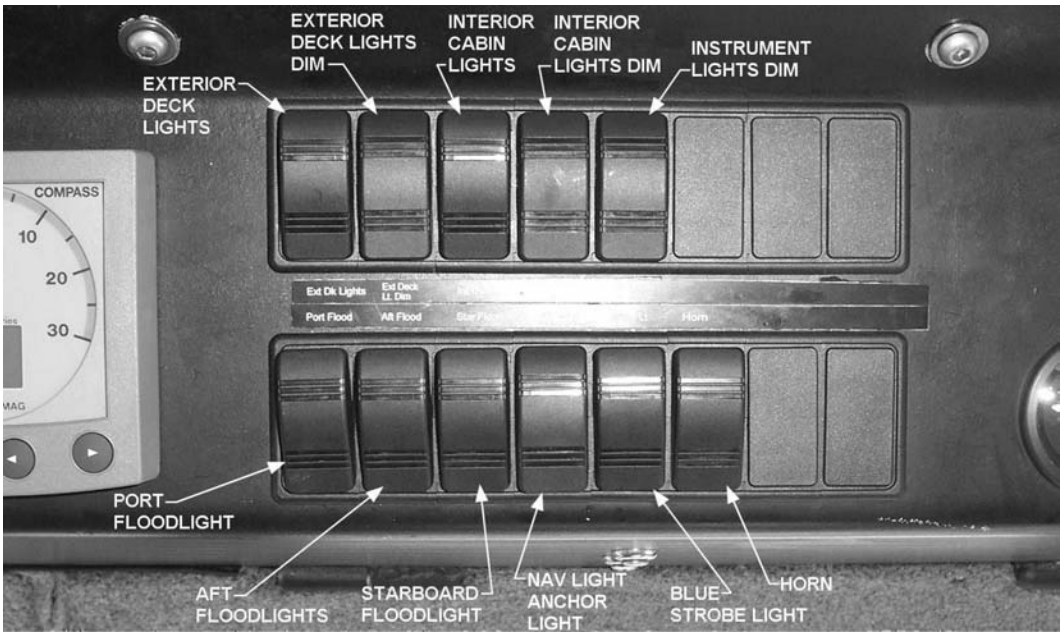


Figure 3-82
Light Switch Panel (RB-HS)

Figure 3-83
Navigation Light (RB-HS)

Figure 3-84
Floodlights (RB-HS)

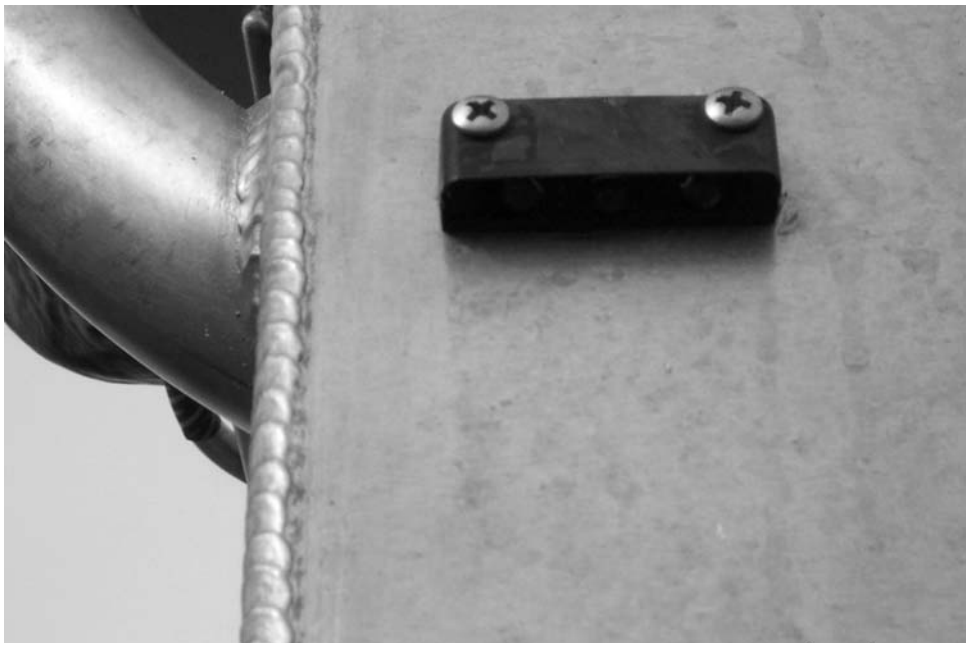


Figure 3-85
Exterior (Deck Edge) Light (RB-HS)

Section O. Hull Exterior Lighting (RB-S)

Introduction

The RB-S is equipped with exterior lighting to comply with collision regulations (COLREGS) for specific missions.

O.1. Searchlight

The searchlight (**Figure 3-86**) is mounted on the centerline atop the cabin and is controlled by a remote control panel (**Figure 3-87**) mounted on the OHIP. The searchlight is rated at approximately 180,000 candlepower and can be rotated 360 degrees. The beam can be elevated 18 degrees up and 45 degrees down.

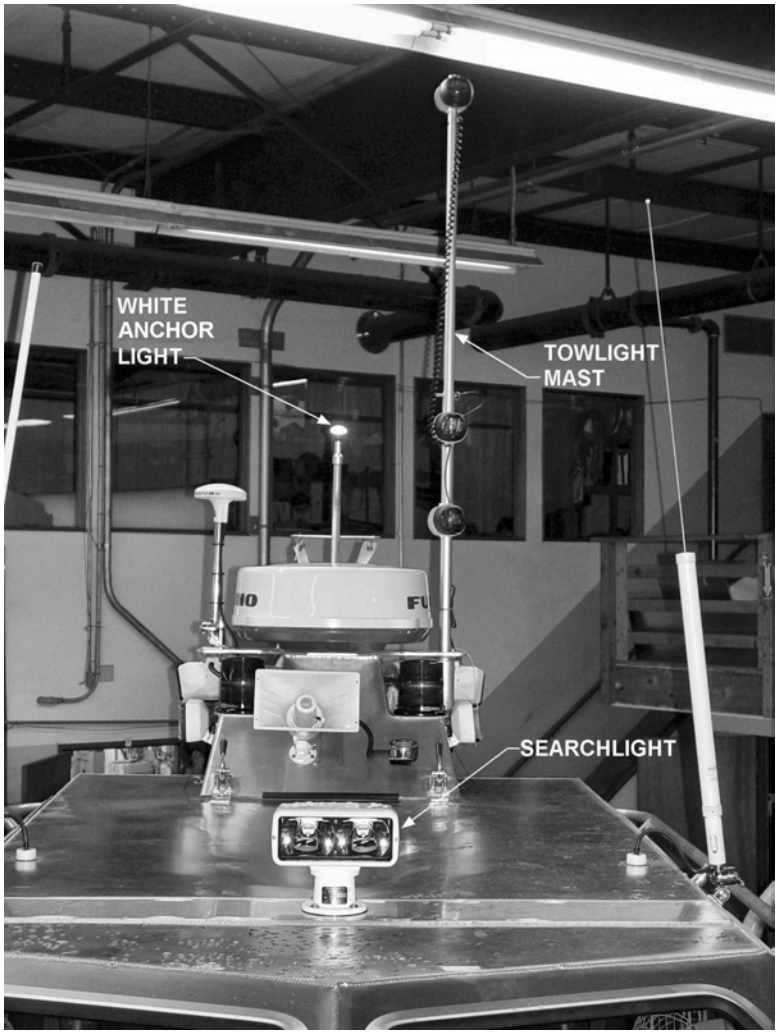


Figure 3-86
Cabin Roof Lights (RB-S)

Figure 3-87
Searchlight Control (RB-S)

O.2. Light Switch Panel

The light switch panel (**Figure 3-88**) is located on the starboard side of the OHIP above the coxswain. The following lights are controlled from the light switch panel:

Port (red) navigation light (**Figure 3-89**)	Port forward on upper cabin bulkhead
Starboard (green) navigation light (**Figure 3-90**)	Starboard forward on upper cabin bulkhead
Anchor light (white) (**Figure 3-86**)	Atop the radar pod
Port and starboard floodlights (**Figure 3-91**)	Port and starboard on the side of radar pod
Aft floodlights (**Figure 3-91**)	Aft port and starboard on the aft frame of radar pod
Exterior (deck edge) lights (**Figure 3-90**)	Exterior cabin bulkhead, port and starboard, outboard along the deck edge
Law enforcement lights (2) (blue) (**Figure 3-91**)	Atop the radar pod, port and starboard

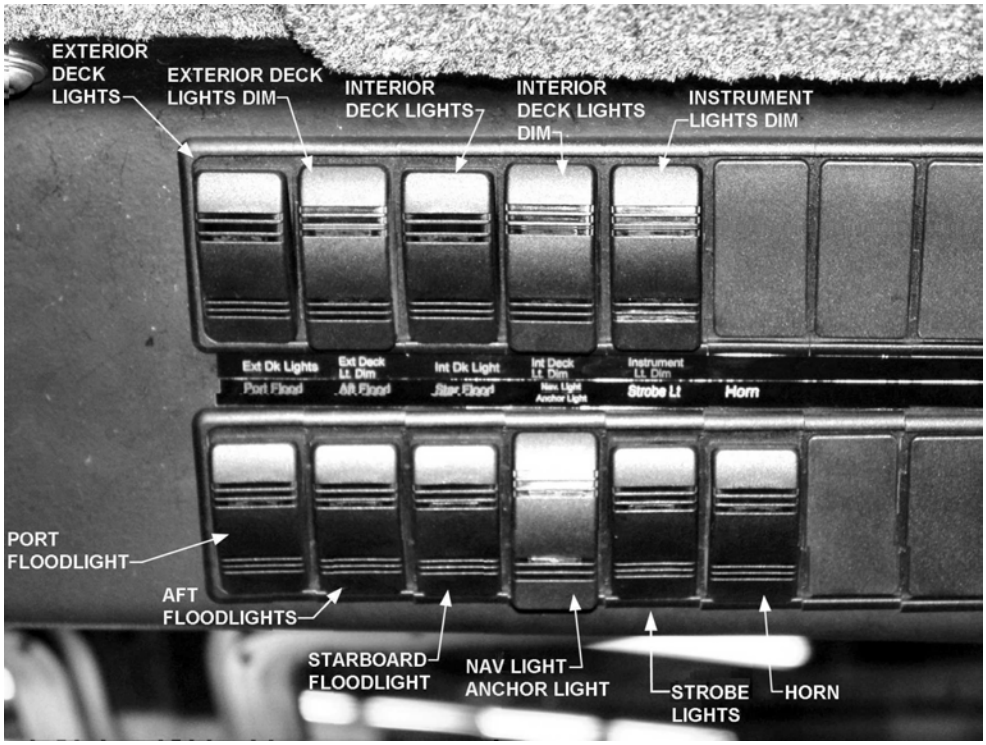


Figure 3-88
Light Switch Panel (RB-S)

Figure 3-89
Port Navigation Light (RB-S)

Figure 3-90
Starboard Navigation Light and Deck Edge Lights (RB-S)

Figure 3-91
Floodlights and Law Enforcement Lights (RB-S)

O.3. Towlight Mast

A collapsible towlight (**Figure 3-92**) mast is stowed inside the cabin on the aft bulkhead, above the cabin door. When required, it can be quickly erected on the port aft side of the radar pod (**Figure 3-93**) and extended and locked into place using a ball-lock pin. Two electrical connectors labeled Tow #1 and Tow #2 (astern and alongside towing) mate with a 12-VDC utility receptacle located on the horizontal aft port surface of the radar pod.

Figure 3-92
Towlight Mast Stowed (RB-S)

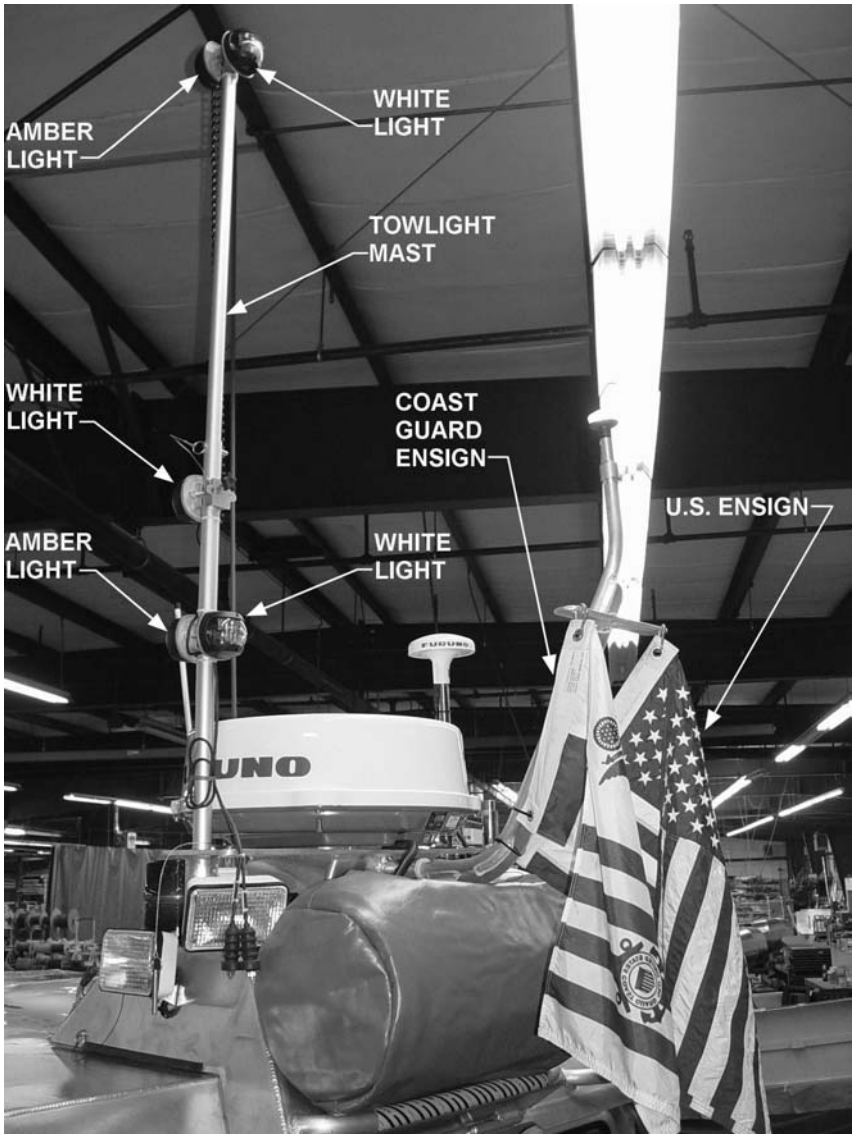


Figure 3-93
Towlight Mast

Section P. Ancillary Systems and Furnishings

Introduction

This section discusses ancillary systems and furnishings that are installed on or furnished with Defender Class boats.

P.1. Windshield Wipers and Washer

Defender Class boats utilize two 12-VDC dynamic park windshield wiper motors (**Figure 3-94**) mounted in the cabin, port and starboard, adjacent to and outboard of the windshields. Two microprocessor controlled, wiper switches (**Figure 3-95**), mounted on the OHIP starboard side, control the wiper motor and washer operation. The switch has six positions:

- Off/Park
- Long Delay
- Intermittent Delay
- Short Delay
- Low Speed/High Speed

Depressing the switch will actuate the wipers for three cycles and inject the windshield wash solution. A 4-liter windshield wash reservoir is mounted in the cabin.

P.2. Cabin Fans

Defender Class boats have cabin fans (**Figure 3-94**) mounted on the OHIP, outboard port and starboard. The fans can be adjusted stationary or 120 degrees oscillation. The fans require 12 VDC and utilize an ON-OFF switch mounted on the base of the fan.

Figure 3-94
Windshield Wiper Motor and Cabin Fan

Figure 3-95
Windshield Wiper Switches

P.3. Fire Extinguisher(s)

Defender Class boats have two B-1 type fire extinguishers (**Figure 3-96**) installed. One is mounted in the cabin, port side on the heater access panel, and one is mounted in the starboard aft equipment locker. Each extinguisher contains approximately two pounds of dry chemical agent (ammonium phosphate) that will discharge in 9 to 10 seconds once the handle is activated. This type of extinguisher is designed to be used on Class A, B, and C fires.

Figure 3-96
B-1 Type Fire Extinguisher

P.4. First Aid Kit

One first aid kit is provided with each Defender Class boat and is stowed inside the cabin. The first aid kit contains four modules equipped to treat injuries normally encountered during craft underway evolutions. Each module contains specific supplies to treat common first aid problems, cuts and splinters, sprains and fractures, CPR, and burns. The kit also contains a place to store personal over-the-counter medications and prescription drugs.

P.5. Cabin Dome Lights

Two cabin dome lights (**Figure 3-97**) are installed on the overhead at the centerline, fore and aft inside the cabin. The dome lights operate on 12 VDC and have a base mounted switch for red or white illumination.

Figure 3-97
Cabin Dome Light

P.6. Horn

A 12-VDC diaphragm type horn (**Figure 3-98**) is mounted on the forward port face of the radar pod. The horn is actuated by a switch on the OHIP in the cabin and produces a 106-decibel blast.

Figure 3-98
Horn

P.7. Miscellaneous Stowage

Areas to stow approved deck gear and mission essential equipment are located under the aft cabin seats on the RB-HS and RB-S. On the RB-HS and RB-S, the boat hook is stowed inside, on the aft cabin door. The RB-HS has a holder for fenders on the starboard aft exterior cabin bulkhead.

P.8. Emergency Position Indicating Radio Beacon

Defender Class boats are outfitted with a Category II, 406 MHz EPIRB (**Figure 3-99**). These EPIRBs are manually deployable, self-buoyant units equipped with a self-test feature that confirms operation as well as battery condition and GPS position data. The EPIRBs use GEOSAR satellites that are in geostationary high-earth orbit and can instantly relay emergency transmissions. The EPIRB provides location accuracy to 0.05 NM and can provide data to search and rescue (SAR) units within 5 minutes after activation and signal detection.

Figure 3-99
EPIRB

Chapter 4
Crew Requirements

Introduction

The *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. I*, COMDTINST M16114.32 (series), provides minimum standards and guidelines for competence onboard Defender Class boats. Each crewmember should be familiar with the duties of the other crewmembers in addition to his/her own duties. It is important for a crewmember to know and commit to memory all important characteristics of the boat and its equipment, and which procedures to follow in the event of a casualty. Each crewmember should mentally rehearse the procedures each member of the crew would follow during any operational casualty. Teamwork is the common thread that allows the crew to succeed. Whenever the opportunity is available, the crew should get the boat underway to practice operational and emergency procedures.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Minimum Crew	4-3
B	Coxswain	4-5
C	Crew Members	4-7
D	Passengers	4-9
E	Safety Equipment	4-11

Section A. Minimum Crew

Introduction

Defender Class boats are designed to operate with a minimum crew of two qualified personnel. Additional qualified and "under-instruction" crewmembers shall be assigned based upon the type of mission.

A.1. Certified Crew

The minimum crew of two shall be a coxswain and a crew member. The coxswain and crew member shall meet all qualification requirements of the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. II*, COMDTINST M16114.33 (series).

Section B. Coxswain

Introduction

The U.S. Coast Guard places great trust in each coxswain and his or her ability to accomplish the assigned missions in a safe and professional manner even under adverse conditions. The position of coxswain is one of high regard and great responsibility.

The coxswain is responsible for the boat, its crew, and passengers during every mission. The coxswain assigns and directs all onboard functions during each operation.

B.1. Authority and Responsibility

The extent of the authority and responsibility of the coxswain is specified in *U.S. Coast Guard Regulations,* COMDTINST M5000.3 (series), as follows:

> *"The coxswain shall be responsible, in order of precedence, for the safety and conduct of passengers and crew; the safe operation and navigation of the boat assigned; and the completion of the sortie or mission(s) assigned or undertaken pursuant to USCG policy and regulations. An underway coxswain will at all times respond, within the limits of capabilities and legal authority, to observed hazards to life or property, and violations of law or regulations."*

The coxswain is the direct representative of the Commanding Officer (CO) or Officer-in-Charge (OIC) and as such, (subject to *Articles 88-89* of the *UCMJ*) has the authority and responsibilities that are independent of rank or seniority in relation to other personnel embarked. The authority and responsibility of the coxswain exist only when the boat is engaged on a specific sortie or mission.

B.2. Relief of Responsibility

The only person embarked in the boat who may relieve the coxswain of the responsibility as described above is:

- The CO, OIC, Executive Officer (XO), or Executive Petty Officer (XPO).
- A senior officer at the scene of a distress emergency, or other abnormal situation, who exercises authority under the provisions of *U.S. Coast Guard Regulations,* COMDTINST M5000.3 (series), whether or not other units are involved.

Section C. Crew Members

Introduction

Under direct supervision of the coxswain, the crew is responsible for line handling, acting as lookout, and assisting the coxswain as required during all evolutions or maneuvers.

C.1. Certified Crew Member

The crew member must be certified in accordance with the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. I*, COMDTINST M16114.32 (series) and *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. II*, COMDTINST M16114.33 (series).

Additionally, the crew member may be responsible for operating the communications/navigation equipment as directed by the coxswain.

C.2. Additional Crewmembers

Additional crewmembers are assigned by the coxswain and certified by the CO/OIC based upon mission requirements.

Section D. Passengers

Introduction

Defender Class boats are designed to carry up to four crew in the cabin. Six additional crew or passengers can be carried in support of various missions not to exceed designed weight capacity. Crew and passengers shall be seated as directed by the coxswain.

Section E. Safety Equipment

E.1. Personal Protective Equipment

During all boat operations, crewmembers shall wear PPE as required by the *Rescue and Survival Systems Manual*, COMDTINST M10470.10 (series).

WARNING

The use of the engine kill switch is required whenever the boat is started or is underway. The engine kill switch is located below the start switch. The activation clip for the kill switch MUST be inserted into the switch body to start the engine. The lanyards (**Figure 3-8** (RB-HS), **Figure 3-9** (RB-S)) MUST be properly attached to the coxswain at all times during boat operation. A second kill switch lanyard with activation clip MUST be carried onboard to enable remaining crewmembers to operate the boat in the event the coxswain is ejected.

NOTE

The RB-HS utilizes two control panels with warning indicators for starting and stopping the outboard engines. Each control panel has an engine kill switch. The RB-S has a single control panel with warning indicators for starting and stopping the outboard engines. The RB-S control panel has only one engine kill switch, which if removed, will stop both engines.

NOTE

The coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

Chapter 5
Operational Guidelines

Introduction

This chapter describes how to use Defender Class boats in the safest and most efficient manner. These policies and performance criteria should be used as guidelines for boat operations. Within these guidelines, consider *Navigation Rules, International-Inland*, COMDTINST M16672.2 (series), local operating conditions, and the skill of the crew to determine how Defender Class boating capabilities are to be used. These factors must be considered prior to each sortie or mission.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Operating Parameters	5-3
B	Performance Data	5-7
C	Performance Monitoring	5-9

Section A. Operating Parameters

Introduction

The readiness of Defender Class boats shall be continuously monitored to ensure that they are capable of unrestricted operations. This monitoring is accomplished through a variety of programs, including daily boat checks, the boat preventive maintenance system (PMS) schedule, engineering inspections, and ready for operation (RFO) evaluations.

Operating parameters for Defender Class boat crewmembers include the following areas:

- Disabling Casualties
- Restrictive Discrepancies
- Major Discrepancies
- Minor Discrepancies
- Responsibilities
- Environmental Limits

A.1. Disabling Casualties

Disabling casualties are those that make the boat not serviceable. *Appendix D* contains a listing of disabling casualties. If a disabling casualty is identified, the boat shall not get underway until the casualty is corrected, and command notifications are made.

Disabling casualties shall be reported immediately to the CO/OIC. The boat shall be immediately placed in "Charlie" status and repaired. If the casualties cannot be repaired within 48 hours, a casualty report (CASREP) shall be sent within 24 hours of the casualty.

A.2. Restrictive Discrepancies

Restrictive discrepancies are those that restrict the operations of the boat such that it can perform some, but not all, missions safely. *Appendix E* contains a listing of restrictive discrepancies.

A.2.a. Reporting Restrictive Discrepancies

Restrictive discrepancies shall be reported to the CO/OIC if the discrepancy cannot be repaired within 1 hour. The boat shall be immediately placed in "Charlie" status and shall not get underway until the discrepancy is corrected, or a waiver has been received. If the discrepancy cannot be repaired within 48 hours, a CASREP shall be sent within 24 hours of the discrepancy. The CO/OIC is responsible for monitoring the progress of repairs to these discrepancies.

Step	Procedure
1	The coxswain shall immediately notify the CO/OIC with all pertinent information and a recommendation as to whether to continue or abort the mission.
2	The CO/OIC shall notify the coxswain as to whether or not continuing the mission is authorized and the conditions under which the boat may be operated.

A.3. Major Discrepancies

Major discrepancies are those that degrade the effectiveness of the boat to perform one or more missions. *Appendix E* contains a listing of major discrepancies.

A.4. Minor Discrepancies

Minor discrepancies do not affect the operational readiness of the boat. However, a boat with minor discrepancies does not meet the standardization criteria established for the boat.

In the event that the addition of portable equipment, not part of the standard boat outfit, is necessary to meet mission needs, units are authorized to temporarily carry this extra equipment. This authorization is on a case-by-case basis only, and care must be taken to properly secure any extra gear and to ensure it does not interfere with safe egress or the boat's standard outfit/systems. Under no circumstances shall permanent alterations be made to power, stow or in any way accommodate extra equipment.

A.5. Responsibilities

The coxswain is always responsible for the safe operation of the boat. The coxswain must decide if the mission warrants subjecting the crew and boat to the danger defined by the mission, weather, and sea conditions anticipated.

A.5.a. Disabling Casualty - Underway

In the event that the boat sustains a disabling casualty while underway, the boat crew shall inform the coxswain who will immediately contact the CO/OIC or Operational Commander.

A.5.b. Restrictive Discrepancy - Underway

In the event the boat sustains a restrictive discrepancy while underway, the coxswain should not normally proceed without authorization, unless aborting the mission would increase the level of risk. The situation and recommendations must be effectively communicated to the Operational Commander to allow for prudent risk assessment by all levels. The following is the procedure for communicating the discrepancy while underway:

Step	Procedure
1	The coxswain shall immediately notify the CO/OIC with all pertinent information and a recommendation as to whether to continue or abort the mission.
2	The CO/OIC shall notify the coxswain as to whether or not continuing the mission is authorized, and the conditions under which the boat may be operated.

A.5.c. Major Discrepancy

The occurrence of major discrepancies shall be documented. A plan to correct these discrepancies shall be formulated and carried out. The Operational Commander is responsible for monitoring the status of repairs to these discrepancies.

A.5.d. Minor Discrepancy

The occurrence and repair of minor discrepancies shall be documented and monitored at the unit level.

Casualty/Discrepancy	Consequence	Required Action
Disabling Casualty "Boat is not serviceable."	Not authorized to get underway. Notify the CO/OIC immediately.	Assign "Charlie" status to the boat, and commence repairs immediately. Submit CASREP if applicable.
Restrictive Discrepancy "Boat and crew cannot perform all missions safely."	Operations restricted. Notify CO/OIC if repairs cannot be made in 1 hour.	Create repair plan and set deadline for completion of repairs. CO/OIC shall monitor progress of repairs. Any operations before restrictive discrepancies are repaired require written waiver by the Operational Commander. Submit CASREP if applicable.
Major Discrepancy "Boat and crew can perform all missions but some degradation in effectiveness or readiness should be expected."	Operations unrestricted. Discrepancy occurrence and repair is documented.	Maintenance plan is carried out. CO/OIC shall monitor status of repairs to the discrepancies.
Minor Discrepancy "Boat and crew readiness not affected nor impaired. Boat does not meet standards."	Operations unrestricted. Discrepancy occurrence and repair is documented.	Maintenance plan is carried out. CO/OIC monitors completion of maintenance/repair.

A.6. Environmental Limits

WARNING

The following is a critical operational and environmental limitation:

- maximum sea state for transiting (6 feet, no surf)

WARNING

Do not operate in breaking seas or surf conditions.

Section B. Performance Data

B.1. Fuel Consumption

Fuel consumption and operating range are affected by engine tuning, weather conditions, trim, type of evolution, and operating area. The RB-HS is capable of operating a maximum of 175 NM at 35 knots and the RB-S 150 NM at 35 knots, with a normal load (full load of fuel, liquids in machinery at normal levels, crew of two). Fuel consumption information may be found in **Table 5-1**.

Table 5-1
Fuel Consumption Information

- Engines: BF225 Honda, 4-Stroke, RH-LH
- Fuel tank capacity: 125 gallons (RB-HS), 105 gallons (RB-S)
- Propellers: Mercury Offshore or Vensura Series, 14x19 P, RH-LH

RPM	KNOTS	GPH
6000	46	44
5500	42	32
4500	38	20
4000	34	16
3500	26	14
3000	22	11
2500	16	7
2000	10	6
1500	8	5
1000	7	4
700	4	1

WARNING The coxswain is responsible for ensuring that all required personal safety equipment is worn, and worn correctly.

B.2. Seakeeping Positioning the vessel with respect to the wind, seas, and other craft is essential to prevent damage to the hull or injuries to the crew.

B.2.a. Operating in Beam Seas

Operating with the seas on the beam is more uncomfortable than dangerous when following basic boat handling guidelines. Use the following techniques to minimize danger:

- Tacking - With large seas on your beam, tack across the seas at a slight angle in a zigzag fashion. This prevents exposure of the beam to heavy swells.
- Changing Course - To change course heading, allow the boat to lose headway, turn the wheel hard over, and apply power to come smartly to the new heading.

B.2.b. Operating in Following Seas

Following seas present the greatest dangers to Defender Class boats. The boat does not have the balanced buoyancy or ability to lay-to in a following sea. The operational limitations are the controlling guideline and must be followed at all times. Consider the following point and technique when operating under these conditions:

- Do not power the boat over the crest of a wave and into the trough of the next wave or bury the bow into the back of the next wave.

B.3. Stability By virtue of hull design and equipment placement, Defender Class boats provide for stable maneuvering through all operating speeds. Ensuring the deck areas are always free of water and eliminating the free surface affect of liquids are essential to maintaining stability of the boats.

B.4. Speed Defender Class boats achieve a top speed of approximately 46 knots at 6000 RPM.

NOTE Do not use rapid accelerations from dead-in-the-water (DIW) to full speed except when necessary. This conserves fuel and helps prolong engine life.

NOTE Avoid rapid acceleration unless absolutely necessary to prolong engine life and conserve fuel. Maximum speed/power should only be used when operationally necessary. Under non-urgent conditions, operate the boat at cruise speed.

Section C. Performance Monitoring

C.1. Performance Monitoring

It is essential that the coxswain and crewmembers be aware of installed monitoring equipment, gauges, and warning indicators, to ensure safe and efficient operation of the RB-HS and RB-S propulsion and ancillary systems. Crewmembers should be aware of the "normal range" or indication of all gauges and indicators, and report and react accordingly when changes occur.

C.2. Control Panel Indicators

The control panel (**Figure 5-1** (RB-HS) and **Figure 5-2** (RB-S)) is attached to the dash panel, starboard side of the helm below the throttle controls. The panel contains the following:

- Ignition switch
- Engine kill switch
- Alternator (ACG) indicator
- Programmed fuel injection (PGM-FI) indicator
- Oil pressure indicator
- Overheating indicator

NOTE

The RB-HS utilizes two separate control panels for engine start, stop, and monitoring. The RB-S uses one control panel for both engines. Panel indicators and functions are identical.

Figure 5-1
Control Panel Indicators (RB-HS)

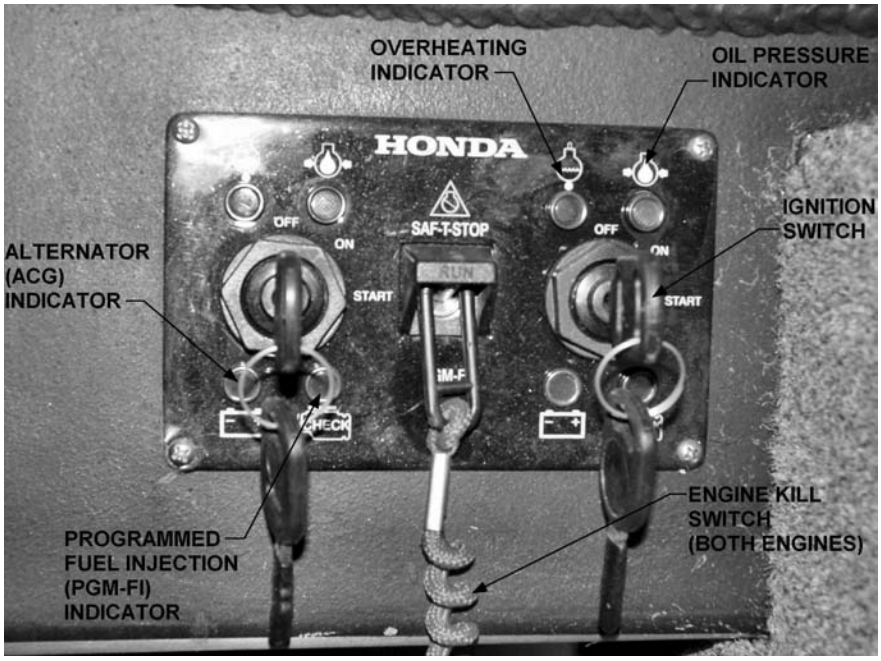


Figure 5-2
Control Panel Indicators (RB-S)

C.2.a. Overheating Indicator	If the engine overheats, the RED indicator light will come on, engine speed will be gradually reduced to approximately 1800 RPM and the engine will stop after 20 seconds. The overheating indicator is activated via the engine control module (ECM) by two overheat sensors mounted on the engine. The Honda 225-HP engines require approximately 12 PSI water pressure with a minimum water pressure of 5 PSI to maintain adequate engine cooling and prevent engine damage.
C.2.b. Oil Pressure Indicator	If oil pressure becomes low, less than 23 PSI at 1800 RPM, the GREEN oil pressure light will go off. If at cruising speed, the ECM will gradually decrease engine speed. Stop the engine and check and service the oil level. Restart the engine. The GREEN indicator light should come on within 30 seconds and throttle operation should be normal. If the engine protection system remains activated, oil indicator light *off*, engine RPM will not increase with throttle movement. Stop the engine and repair as required.
C.2.c. Alternator Indicator	The RED indicator light will come on if there is a malfunction in the charging system. Each engine alternator is rated at 12 VDC, 60 amp at 2300 RPM, and produces 48 amps of power at 1000 RPM. The alternators are belt driven by the engines and protected by a 150-amp fuse installed in the fuse case mounted on the engine.

C.2.d. Programmed Fuel Injection Indicator

The RED indicator light will come on when the ECM senses an abnormality from one of the nine engine-mounted sensors. Continue to carefully monitor engine performance and stop engine if performance deteriorates or becomes erratic.

C.3. Helm Dash Panel

The helm dash panel (**Figure 5-3** (RB-HS) and **Figure 5-4** (RB-S)) mounts the following:

- Trim tilt indicators
- Tachometers
- Fuel totalizer

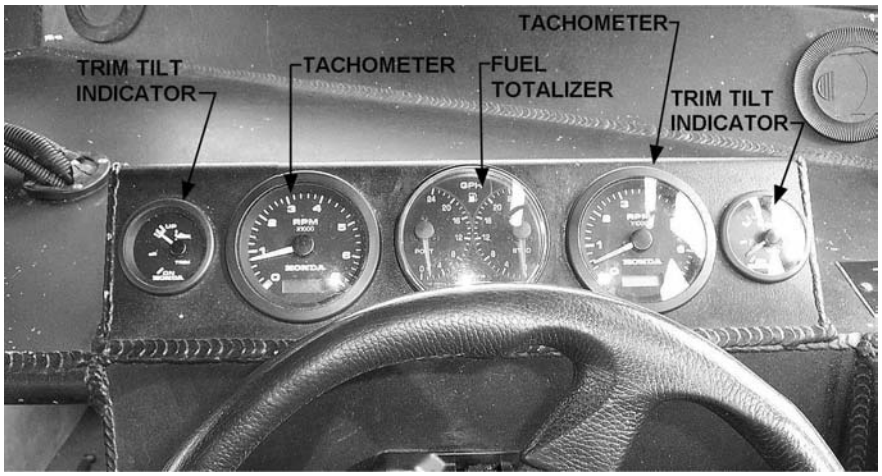


Figure 5-3
Helm Dash Panel (RB-HS)

C.3.a. Trim Tilt Indicators

The trim tilt indicators indicate the trim angle of the outboard motors and have a range of -4 to 16 degrees. Use the trim tilt indicators when operating the power tilt/trim switch to achieve best performance from the boat.

C.3.b. Tachometer

The tachometer shows engine speed in RPM. The Honda 225 engine is designed to idle at 650±50 RPM. The tachometer also has a display for engine operating hours.

C.3.c. Fuel Totalizer

The fuel totalizer is a single gauge that provides an indication of fuel consumption and rate in GPH for each engine.

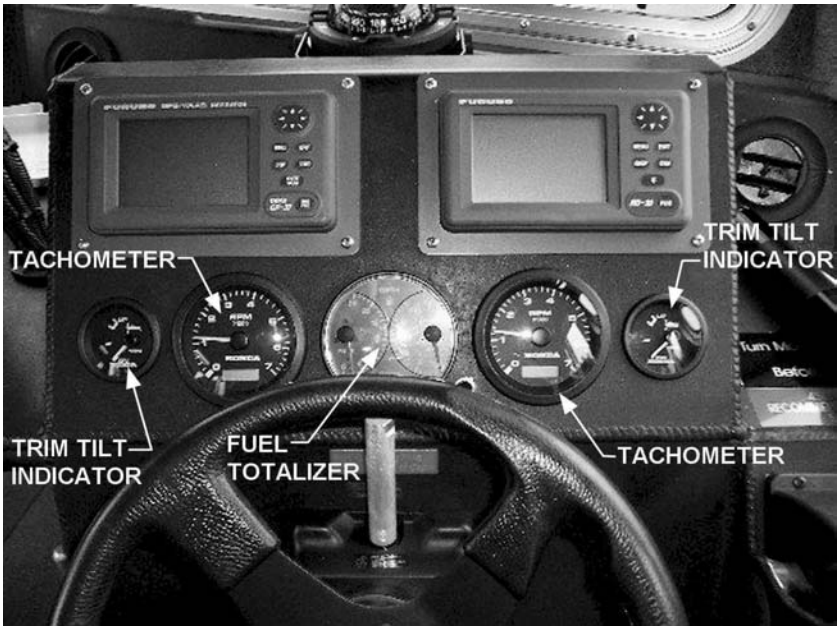


Figure 5-4
Helm Dash Panel (RB-S)

C.4. Voltmeters

Two voltmeters (**Figure 5-5**), one for each engine, are located on the OHIP. The voltmeters provide a visual indication of the voltage output of each engine's alternator. During operation, the minimum voltage indicated should be 12.7 volts.

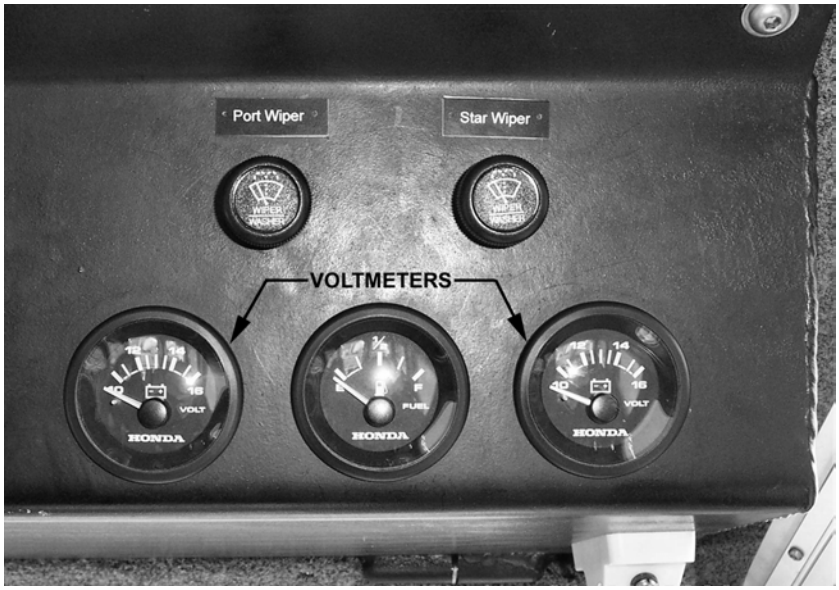


Figure 5-5
Voltmeters

Chapter 6
Mission Performance

Introduction

The actions and techniques described in this chapter are products of field experience. They are intended to give boat crewmembers information on how Defender Class boats perform and react in various mission scenarios. The information is not intended to provide the "only way" to perform an action or complete a mission. Boat crews should use effective communications and teamwork skills along with this general information to adapt their actions to each unique mission scenario.

Information in this section alone does not qualify a crewmember. Observe these procedures and apply skills developed through practice to effectively use Defender Class boats to perform missions.

In this Chapter

This chapter contains the following sections:

Section	Topic	See Page
A	Boat Davit Operations	6-3
B	Starting Procedures	6-5
C	Underway	6-7
D	Going Alongside Boats and Vessels of Interest	6-9
E	Handling Characteristics	6-13
F	Operating with Helicopters	6-21
G	Anchoring	6-23
H	Towing	6-25
I	Securing Procedures	6-27
J	Loading and Unloading Boat for Air Transport	6-29

Section A. Boat Davit Operations

Introduction

Although Defender Class boats are fitted with lifting points for hoisting the boat with a single point davit, they were not designed to be deployed on a large vessel.

Section B. Starting Procedures

Introduction The following procedures must be followed before starting a cold engine.

B.1. Pre-Start The following pre-start checks must be accomplished before the first mission of the day and prior to engine start:

Step	Action
1	Ensure hull fuel tank is full. Use fuel level gauge as required.
2	Check fuel filter sediment/water bowl for presence of contamination. Drain sediment/water bowl as required.
3	Ensure the port and starboard cooling water intakes on the lower engine shaft housing are free of debris.
4	Check outboard engine cover gasket for damage. Check that outboards are secure to the transom and all mounting hardware is tight.
5	Trim engines down until lower unit is submerged (ensure full tilt/trim travel on each engine).
6	Ensure engine oil level is filled to 'FULL' mark.
7	Check hydraulic steering system for leaks at helm and at steering ram by outboards.
8	Squeeze primer bulbs until firm.
9	Ensure the engine kill switch clips are installed and lanyards attached.
10	Install start keys and turn key to *on* position. Ensure the engine alarm system is operating.

B.2. Engine Starting

The following procedures must be followed for starting the engines:

Step	Action
1	Set throttle levers to *neutral* position at all operating stations.
2	Ensure electronics, antennas, and speakers are secured.
3	Ensure the engine kill switch clips are installed and lanyards attached. One spare clip and lanyard must be onboard and stored inside the cabin.
4	Turn key to *start* position until engine starts.
5	Check outboards for nominal or adequate cooling water output at telltale discharge on each engine.
CAUTION !	If cooling water output is not evident, immediately secure engine and investigate.
6	Check crew and passengers for appropriate PPE including helmets (if required).

B.3. Energizing Equipment

The following steps must be completed prior to getting underway:

Step	Action
1	Close (turn *on*) all of the remaining breakers on the 12-VDC power panels.
2	Energize and test all installed electronic components.
3	Conduct a test of the hydraulic steering ensuring that motors respond appropriately.
4	Test throttle operation in *forward* and *reverse*.
5	Ensure gear is properly stowed and watertight integrity is set.
6	Inform coxswain on the status of all engineering and electronic systems and that the boat is ready to get underway.

Section C. Underway

Introduction

It is the responsibility of the coxswain and crewmembers to ensure that once the vessel is underway the boat and its systems are operated in a safe and efficient manner. The safety of the crew and any embarked personnel is also incumbent on all crewmembers.

After getting underway, observe all appropriate machinery gauges. If an abnormal condition develops, take corrective action to prevent further damage, in accordance with the *U.S. Coast Guard Boat Operations and Training (BOAT) Manual, Vol. I*, COMDTINST M16114.32 (series). Report any abnormal conditions to the coxswain.

C.1. Personal Protective Gear

Always observe requirements of this manual, the *Rescue and Survival Systems Manual*, COMDTINST M10470.10 (series), and the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series), for wearing protective clothing, personal flotation devices, and boat crew signal kits.

C.2. Communications

Crew communications and coordination is the key to safe operations. Crewmembers should inform the coxswain of their location when moving about the deck. Engine noise can make crew communications difficult on Defender Class boats. Speak loudly and clearly repeat as necessary until acknowledged.

NOTE

When operating the boat with minimal crew, effective crew communications are critical. Speak loud enough to be heard over the background noise. Ensure the receiver hears and understands the message being passed. A common strategy is to have the receiver repeat back the message that was sent.

NOTE

The enclosed steering station can create a sense of isolation from the elements and other marine traffic. Crewmembers should use all available means to maintain awareness of wave action, winds, currents, and traffic.

Section D. Going Alongside Boats and Vessels of Interest

Introduction

The following is a generic procedure for going alongside. Defender Class boat crews must be familiar with the applicable U.S. Coast Guard instructions and Standard Operating Procedures (SOP) for going alongside a vessel of interest and shall be accomplished in accordance with the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series), *Chapter 10*.

Step	Action
1	Ensure that communications between the Defender Class boat and the Operational Commander are established and reliable.
2	Attempt to make and establish contact with the vessel of interest on designated marine band frequencies.
3	Make approach preparations and inform the crew. The coxswain should determine where to make contact with the vessel.
WARNING Pick a contact point well clear of a larger vessel's propeller (including in the area of suction screw current), rudder, and quarter wave. Forces from these could cause loss of control.	
4	Conditions permitting, match your speed to the other vessel, and then start closing in from the side.
5	Close at a 15- to 30-degree angle to the other vessel's heading. This should provide a safe rate of lateral closure at no more than one-half the forward speed.
NOTE If your initial heading was parallel to the other vessel, you will have to increase speed slightly when you start to close at an angle.	
WARNING Applicable U.S. Coast Guard instructions and SOP must be strictly adhered to when/if the Defender Class boat is in close proximity to any vessel that fails to identify itself.	
6	If contact has been made with the vessel of interest, determine if a sea painter has been provided for going alongside. Also, determine if a boarding ladder (if necessary) is available and rigged.

NOTE In some instances, a sea painter may be used in going alongside a larger vessel underway. The sea painter is a line used to sheer a boat clear of a ship's side, when underway or at anchor, to hold a boat in position under shipboard hoisting davits, and occasionally to hold the boat alongside a ship in order to embark or disembark personnel. It leads from the larger vessel's deck, well forward of where the boat will come alongside.

WARNING Never secure the sea painter to the boat's stem nor to the side of the boat away from the vessel of interest. If secured to the "outboard" side of the boat, capsizing could result.

NOTE As both the Defender Class boat and vessel of interest have headway, the pressure of the water on the boat's bow will cause it to sheer away from the vessel of interest. Use this force by touching on the helm to control sheer, in or out, by catching the current on one side of the bow or the other side. Riding the sea painter will help maintain the position and control of your boat while alongside.

NOTE When sheering in or out, apply rudder slowly and be prepared to counteract the tendency of the boat to close or open quickly.

7	Come alongside of the vessel, matching its course and speed. When close to the larger vessel, and forward of the desired contact point, ask the vessel to pass the sea painter.
8	Receive the sea painter and secure it inboard just aft of the bow.
9	The sea painter is usually passed by use of a heaving line. Quickly haul in the heaving line and adjust the boat's heading and speed to control slack in the sea painter so that these lines do not get into the boat's propeller or mast.
10	Reduce your speed slowly and drift back on the painter (ride the painter).
11	Use helm to hold the boat at the desired position alongside or at some distance off the vessel.
12	If set toward the vessel, apply rudder to sheer the bow out. If too far away, apply rudder to sheer the bow in. The forward strain on the painter will pull the boat and provide steeringway.

NOTE If approaching a vessel anchored in a strong current, the sea painter provides a means to lay alongside. Procedures are the same as if the vessel is making way. Approach from leeward, against the current.	
CAUTION ! Use care when going alongside a vessel of interest so as not to damage the collar.	
13	Make contact with the forward sections of your boat (about halfway between the bow and amidships). Use helm and power (if not on a sea painter) to hold the bow into the other vessel at the same forward speed. Do not use so much helm or power that you cause the other vessel to change course.
14	Ensure that communication with the Operational Commander is established to update the status of the assigned mission. If personnel are to be embarked/disembarked on the vessel of interest, utilize a boarding ladder as provided. Minimize the time alongside. If necessary and following U.S. Coast Guard instructions and SOP, "make-up" to the other vessel rather than relying on helm and power to maintain contact.
15	When the mission is complete, embark all personnel. Sheer the stern in with the helm to get the bow out. Avoid getting set toward the side or stern of the vessel.
NOTE If on a sea painter, its strain sheers the boat clear.	
16	If on a sea painter, use enough speed to get slack in the line, then cast off when clear. Ensure the sea painter is hauled back aboard the larger vessel immediately to keep it from getting caught in the outdrive or mast.
CAUTION ! Never back down when clearing alongside, parallel to another vessel that is making way. Outboard powered vessels with a large portion of weight aft are susceptible for shipping water while backing, particularly in a chop.	
17	Apply gradual power to gain slight relative speed. Maneuver the boat away from the vessel of interest. Continue to update position and status of the mission with the Operational Commander.

Section E. Handling Characteristics

Introduction

Boat handling is a complex skill that requires knowledge and practical, underway experience to build confidence and skill level. Always use forethought and finesse when handling the boat. Know the boat's handling features, monitor weather conditions, and be aware of the operating limitations of the boat.

In this section

This section contains the following information:

Topic	See Page
Turning and Pivoting	6-15
Head Seas	6-16
Beam Seas, Following Seas, and Quartering the Seas	6-17
Effects of Wind	6-18
Station Keeping	6-19

Turning and Pivoting

E.1. Characteristics

Each Defender Class boat turns or pivots, for steering purposes, on its vertical axis, at approximately the aft cabin bulkhead when fully trimmed in. Because of this characteristic (which provides other benefits such as straight-line tracking and planing), coxswains must be aware of the boat's turning capabilities.

WARNING

High-speed turns while improperly trimmed, may result in injury to crew or damage to the boat.

E.1.a. Turning on Plane

Avoid making sharp, high-speed turns while improperly trimmed. Due to the reduced amount of wetted surface (hull in water), sharp, high-speed turns may result in "hooking a chine". This can be hazardous and may result in injury to the crew or damage to the boat. If a sharp turn is required, trim the engines in before turning.

Head Seas

E.2. Buoyancy

The primary consideration when advancing in head seas is to maintain forward momentum and keep the bow into the swell. The buoyant construction of the boat allows it to ride up over oncoming seas.

E.3. Over-Acceleration

When heading into the wind and up the face of large waves, care must be taken to avoid over-accelerating, which can result in the bow being caught and creating a pitch-pole situation where the boat is inverted end-over-end.

Beam Seas, Following Seas, and Quartering the Seas

E.4. Beam Seas

Whenever possible, the coxswain should avoid steering a course parallel (broadside) to heavy swells. Tack across the swells at a 30- to 40-degree angle. If necessary, steer a zigzag course, making each leg as long as possible, and adjust the boat speed for a safe and comfortable ride. Seas directly off the beam of the boat can cause adverse rolling conditions.

When transiting parallel to the seas, the boat will tend to ride the contour of the wave surface. This means that the boat's vertical axis will remain perpendicular to the surface on which the boat is operated. A wave face of 20 degrees will cause a 20-degree heel.

E.5. Following Seas

Following open seas up to 6 feet can be negotiated at full speed as long as the boat remains stable as it travels down the front of the swell. In bad weather, Defender Class boats are relatively safe running before the sea due to their speed. If caught in breaking seas, this advantage is used to ride the back of the waves while adjusting speed as required.

E.6. Quartering the Seas

Taking larger head seas slightly off of either bow can create a more comfortable ride, as the boat may proceed more gently off the back of the wave instead of slamming violently. The speed and angle of approach will have to be adjusted as needed for the optimum ride. This is sometimes referred to as quartering the seas, which is not to be confused with taking a following sea on the quarter.

Effects of Wind

E.7. Maneuverability

In calm or negligible wind and seas, Defender Class boats respond well using standard twin-screw operating practices. In stiff winds, several design features combine to make handling this boat challenging. With the majority of weight and the deepest draft aft, the bow is very susceptible to the effects of the wind. Moderate winds may have an effect on maneuverability and can often be the predominant environmental factor in maneuvering situations. In some cases, it can be difficult to recover and turn the bow into the wind at slow speeds.

Station Keeping

E.8. Stern-To

Station keeping requires concentration to maintain a constant heading and position. The boat tends to work well with its stern to the wind as the bow tends to "weathervane" downwind. If stern-to station keeping is not an option, the operator must use extra care to counteract environmental factors.

Section F. Operating with Helicopters

Introduction

Defender Class boats have installed communications and navigation equipment to operate with helicopters on assigned marine and aviation frequencies. The tactical mission of these boats and their coordination with helicopter operations will be promulgated by applicable U.S. Coast Guard instructions. (See *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series), *Chapter 19*.)

Section G. Anchoring

WARNING If the anchor line fairlead is from any point other than the bow, there is the potential for a tripping hazard and possible capsize. Never anchor from the stern.

Introduction Care must be taken when anchoring to ensure that the anchor line fairlead is over the bow.

NOTE Anchoring procedures are described in the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series).

Section H. Towing

Introduction

Towing a disabled vessel requires a high degree of awareness of all potential hazards, as well as full knowledge of the capabilities and limitations of the particular components within the towing operation. The safety of your crew and the crew of the towed vessel is more important than property.

NOTE

Towing procedures are described in the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series).

WARNING

Due to their limited size and hull design, Defender Class boats are more susceptible to tripping. A boat is said to be tripping when it is towed sideways by an opposing force on its own towline. There is imminent danger that a boat will capsize when in a tripping situation. If your vessel is caught in a tripping situation, the coxswain must attempt to maneuver to position the stern back under the towline; or sever the towline at the bitt.

H.1. Angular Momentum

Overcoming angular momentum can be far more hazardous on smaller non-displacement hulls such as the RB-HS and RB-S. When changing the direction of the tow, the towed vessel will develop angular momentum; the vessel's heading begins to change and it wants to keep changing in that same direction. Attempts to correct angular momentum can create a tripping hazard. Coxswains need to anticipate how the momentum will affect the towed vessel's motion and apply an offsetting force early and gradually.

Section I. Securing Procedures

Introduction

Once a mission is complete, it is essential that boat equipment be correctly secured to enhance subsequent equipment performance and equipment longevity.

I.1. Procedure

The following procedure should be completed after each mission:

Step	Action
1	Secure all non-essential electrical and electronic gear.
2	If operated, ensure heater is "cooled down" prior to securing.
3	Ensure all equipment necessary to moor the boat is available on deck.
4	If necessary, lower the extendable tow light mast, folding light arch, and VHF antennas.
5	Idle and stop engines.
6	Secure all non-essential breakers and switches on the 12-VDC power panels.
7	Turn the battery and accessory battery switches to the *off* position.
8	Secure all pyrotechnics, weapons and ammunition as directed by U.S. Coast Guard instruction or station operating requirements.
9	Check and refill all machinery fluid levels.
11	Refuel the boat and refill the heater fuel tank.
12	Wash the boat down with freshwater.

NOTE Keeping the boat clean and neat is very important to control corrosion. Having aluminum in contact with dissimilar metal, particularly a copper alloy, can cause major corrosion problems. Something as small as a penny left in the bilge can cause serious damage. Maintaining corrosion control is the responsibility of everyone in the crew.

NOTE The mission is not complete until the boat is ready for the next mission.

Section J. Loading and Unloading Boat for Air Transport

Introduction

The following is a generic procedure for loading and unloading the RB-HS or RB-S for air transport on a C-130 aircraft.

J.1. Prior to Loading

Step	Action
1	Ensure battery switches on the 12-VDC main power panel are off.
2	Ensure that no additional pilferable gear is stowed on the deck areas or inside the cabin, anchor/ammunition locker, or aft deck lockers.
3	Ensure both VHF radio antennas atop the cabin are lowered and secured.
4	Remove the searchlight atop the cabin as follows: • Remove the ¼x1½-inch Phillips screws holding the searchlight base to the hull (**Figure 6-1**). • Using a $^{3}/_{16}$-inch Allen wrench, remove the six $^{5}/_{16}$x1-inch bolts that secure the OHIP to the interior cabin overheard. Locate, mark, and carefully disconnect the searchlight wiring. • Reposition OHIP and reinstall and tighten remaining bolts. • Remove the searchlight from atop the cabin. Reinstall the Phillips screws in the exterior cabin overhead. Carefully stow the searchlight to prevent damage.
5	Tilt engines up to port and set engine tilt locks.
6	Contact Air Station Commander, Aircraft (AC) Commander, or Aircrew Member (Loadmaster) for: • Instructions on fuel removal (gasoline and diesel) and verification of fuel tank status. • Dunnage required to distribute boat trailer weight (wheels and tongue jack) equally over the aircraft cargo area floor.
7	Weigh the boat and trailer as configured for air shipment. Provide this information to the Air Station Commander, AC Commander, or Aircrew Member (Loadmaster) to ensure aircraft weight and balance restrictions are not compromised.

8	Upon arrival at the air station: • Ensure all hatches and doors are securely closed, dogged down, but UNLOCKED (aircrew may need access to the boat during flight for inspection).
NOTE If additional clearance between the lowered radar pod and C-130 cargo area overhead is needed, the top dog of the aft cabin door may be removed.	
	• Lower the radar pod as follows: ▪ Remove the ½-inch lock-pins on the port and starboard side of the radar pod. ▪ Loosen and release the stainless steel latches on the forward side of the radar pod. ▪ Using two people, slowly rotate the radar pod aft until the pod's restraining strap supports the weight of the pod.

Figure 6-1
Searchlight Removal

J.2. Loading and Unloading

NOTE The RB-HS or RB-S can be loaded either bow or stern first into the C-130 cargo area. The bow first technique is preferred.

J.2.a. Loading Boat Bow First

Step	Action
1	Ensure the aircraft cargo ramp is fully lowered and the aircraft cabin/cargo area door is fully retracted (open) (**Figure 6-2**).
2	Position two USCG fabricated, extended auxiliary ramps adjacent to the aircraft cargo ramp. This will facilitate rolling wheeled vehicles up the aircraft loading ramp.
3	Ensure all boat trailer straps are secure.
4	Attach the tongue jack wheel.
5	Position a third ramp adjacent to the aircraft cargo ramp to accommodate the tongue jack wheel. This ramp may be fabricated from wood or other material.
6	Position the trailer under the C-130 tail section, bow to the open cargo area door.
CAUTION ! Do not attach the winch to any lateral members of the trailer's frame or the surge brake assembly.	
7	Attach the C-130 cargo winch to both of the trailer safety chains.
8	Ensure spotters are positioned to determine top, bottom, and side clearances of the boat, trailer, and aircraft fuselage components.
9	Slowly winch the boat and trailer into the cargo bay (**Figure 6-3**) of the aircraft and secure as directed by the Aircraft Commander or aircrew.
10	Ensure all doors and hatches on the boat are closed, dogged down, but UNLOCKED.

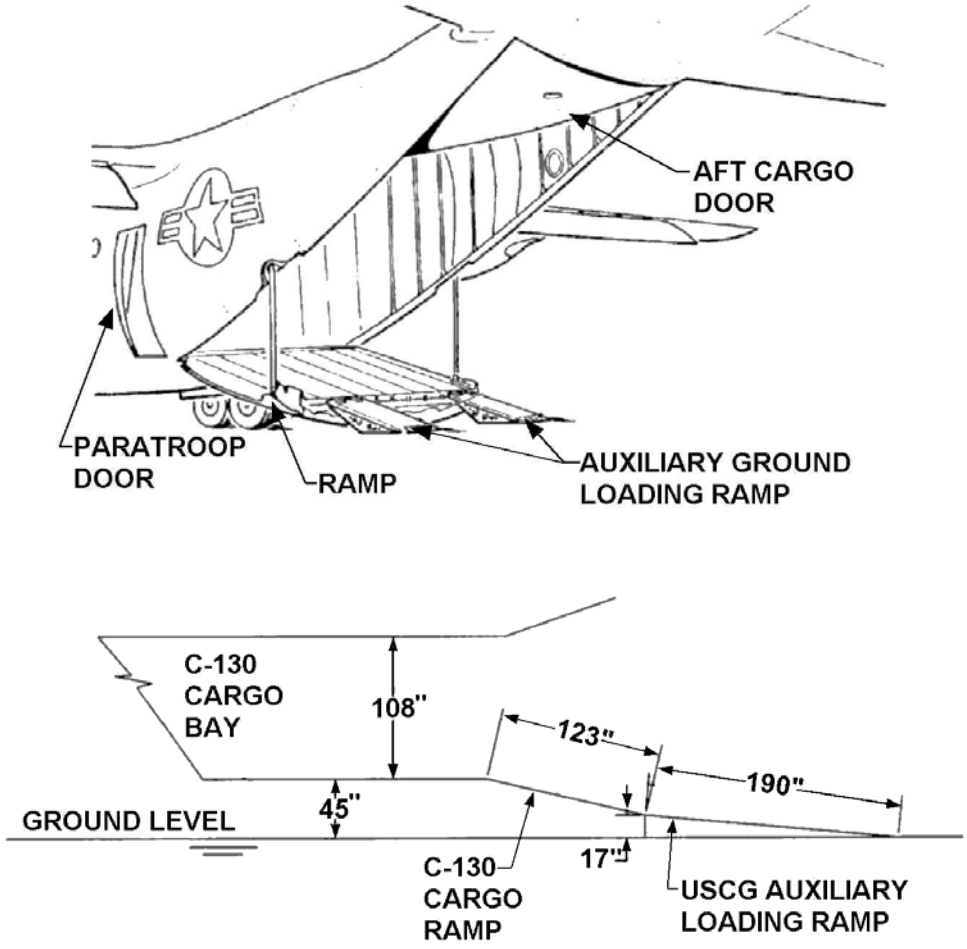


Figure 6-2
C-130 Loading Ramp and Cargo Bay

Figure 6-3
Loading Boat (Bow First)

J.2.b.
Unloading Boat
Bow First

Step	Action
1	Ensure that the aircraft cargo ramp is fully lowered and the aircraft cabin/cargo area door is fully retracted (open) (**Figure 6-2**).
2	Position two USCG fabricated, extended auxiliary ramps adjacent to the aircraft cargo ramp. This will facilitate rolling wheeled vehicles down the aircraft loading ramp.
3	Ensure all boat trailer straps are secure.
4	Ensure C-130 cargo winch is securely attached to the boat trailer safety chains.
5	Remove tie-downs that secure boat trailer to the cargo area floor.
NOTE It maybe necessary to attach the boat's towline to the aft tow bitt, transom tie-down points, or trailer tie-down points to assist in pulling the boat and trailer out of the cargo area.	
6	Ensure spotters are positioned to determine top, bottom, and side clearances of the boat, trailer, and aircraft fuselage components.
7	Using the C-130 cargo winch brake and if required, applying a slight aft pull with the attached towline, slowly move the boat and trailer from the cabin area and down the cargo ramps.
8	When there is sufficient clearance under and around the aircraft fuselage, attach a vehicle with an approved hitch to the trailer and tow the trailer as directed.
9	When directed, reinstall the searchlight, raise the radar pod and other antennas, and prepare the boat for operations.

J.2.c. Loading Boat Stern First

CAUTION ! Do not attempt to use the C-130 cargo winch to load the boat stern first into the cargo area.

Step	Action
1	Ensure that the aircraft cargo ramp is fully lowered and the aircraft cabin/cargo area door is fully retracted (open) (**Figure 6-4**).
2	Position two USCG fabricated, extended auxiliary ramps adjacent to the aircraft cargo ramp. This will facilitate rolling wheeled vehicles up the aircraft cargo ramp.
3	Ensure all boat trailer straps are secure.
4	Ensure spotters are positioned to determine top, bottom, and side clearances of the boat, trailer, and aircraft fuselage components.

CAUTION ! The right combination of tow vehicles, tow-bars, or drawbars is necessary during stern first loading to prevent the tongue of the trailer from becoming too low, thereby raising the aft edge of the boat's cabin and striking the inside overhead of the C-130 cargo area. If this situation cannot be corrected, load the boat and trailer bow first.

5	Slowly back the boat trailer up the C-130 ramp and into the cargo area.
6	When directed by the aircrew, stop the vehicle.
7	After the trailer is secured in the cargo area and when directed by the aircrew, disconnect the vehicle from the boat trailer.

Figure 6-4
Loading Boat (Stern First)

J.2.d. Unloading Boat Stern First

CAUTION ! Do not attempt to use the C-130 cargo winch to unload the boat stern first from the cargo area.

Step	Action
1	Ensure that the aircraft cargo ramp is fully lowered and the aircraft cabin/cargo area door is fully retracted (open).
2	Position two USCG fabricated, extended auxiliary ramps adjacent to the aircraft cargo ramp. This will facilitate rolling wheeled vehicles up the aircraft cargo ramp.
3	Ensure all boat trailer straps are secure.
4	Ensure spotters are positioned to determine top, bottom, and side clearances of the boat, trailer, and aircraft fuselage components.

CAUTION ! The right combination of tow vehicles, tow-bars, or drawbars is necessary during stern first unloading to prevent the tongue of the trailer from becoming too low, thereby raising the aft edge of the boat's cabin and striking the inside overhead of the C-130 cargo area.

5	Back the tow vehicle up and engage the tow vehicle ball with the trailer hitch. Ensure the safety chains and breakaway lever chain are connected to the tow vehicle.
6	Disconnect all tie-downs between the cabin area floor and boat trailer.
7	When all tie-downs have been disconnected and only when directed by aircrew, slowly pull the boat and trailer from the cargo area.
8	Tow the boat and trailer away from the vicinity of the aircraft.
9	When directed, reinstall the searchlight, raise the radar pod and other antennas, and prepare the boat for operations.

Chapter 7
Emergency Procedures

Introduction

Responding to equipment casualties and emergencies aboard Defender Class boats should be second nature to all members of the crew. The ability of crewmembers to take immediate action to control emergency situations is critical, to prevent a bad situation from getting worse. While every event is different, step-by-step procedures help gain control of the casualty and aid in troubleshooting.

The first step in responding to all casualties is to protect the immediate safety of all crewmembers and to communicate the nature of the casualty to the crewmembers. It is the coxswain's responsibility to keep the Operational Commander informed of all emergencies encountered during the operation of the boat.

The coxswain and crew should work together to determine if equipment casualties can be safely repaired while underway. The coxswain must decide whether a casualty has impacted the ability of the boat and crew to complete the mission. The coxswain should not make the decision in a vacuum; input from other crewmembers, as well as communication with the Operational Commander, should be used to determine whether to continue with the mission. The following factors should be considered:

	Factors
1	The safety and physical condition of the crew and vessel.
2	Equipment limitations due to the casualty.
3	Current and forecasted weather and sea conditions.
4	The urgency of the mission.

In this Chapter This chapter contains the following sections:

Section	Topic	Page
A	Capsizing	7-3
B	Steering Casualty	7-5
C	Loss of Control of Engine RPM	7-7
D	Loss of Fuel Pressure	7-9
E	Loss of Lube Oil Pressure	7-11
F	Engine High Water Temperature	7-13
G	Damage to Collar	7-15
H	No Power/Insufficient Power to Communications/Navigation Equipment	7-17

Section A. Capsizing

A.1. Symptom(s)

- Because of the design of the Defender Class boat and the installed collar, it is unlikely that the boat would capsize.

NOTE oat crew personnel should be familiar with the *Boat Crew Seamanship Manual*, COMDTINST M16114.5 (series), *Chapter 16, Water Survival Skills*.

A.2. Actions If the vessel is bottom side up, take the following actions:

WARNING DO NOT use a pyrotechnic signaling device if capsizing occurs. Since the boat uses gasoline for fuel, gasoline may spill from the fuel tank and cover the surface of the water if the craft capsizes.

Step	Action
1	Inflate personal flotation device.
2	Account for all crewmembers.
3	Try to determine if the emergency position indicating radio beacon (EPIRB) has floated clear of the hull and has deployed.
4	Stay as close to the boat as possible. If possible, climb back atop the capsized hull to aid in search and rescue efforts.

NOTE After capsizing, if possible, climb atop the hull. The boat is inherently buoyant even after capsizing. The boat is designed to remain afloat with crewmembers on it in capsized position.

Section B. Steering Casualty

B.1. Symptom(s)

- Sluggish response or no response when wheel is turned to port or starboard.

B.2. Actions

When partial or complete steering loss occurs, take the following action:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Notify the Operational Commander of the casualty.
3	Check for steering fluid in the starboard aft compartment and well deck, around the helm pump, and adjacent to the transom near the steering actuator.
WARNING Do not turn the wheel while crewmembers are inspecting the steering system linkage.	
4	Ensure that all lines and fittings in the steering system are installed and tight.
5	Report all findings to the coxswain.

Section C. Loss of Control of Engine RPM

C.1. Symptom(s)

- Throttle position changed with no apparent change in engine RPMs.
- No ahead or astern movement of the boat.

C.2. Actions

When the engine fails to respond to throttle commands, take the following actions:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Crewmembers should: • Check throttle and shift control cables. • Check throttle arm on engine. • Report all findings to the coxswain.
3	If required, secure engine while in gear.
4	Coxswain report status of casualty to the Operational Commander.

Section D. Loss of Fuel Pressure

D.1. Symptom(s)

- Erratic or unstable engine RPMs.
- Engine stops completely.

D.2. Actions

When it appears that the engine has sustained a loss of fuel pressure, take the following actions:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Verify the fuel tank level at the gauge on the coxswain's console. Sound the fuel tank to ascertain tank level.
3	Crewmembers should: • Check the aft compartments and the well deck for fuel. • Check for the presence of fuel around the engine cover. • Check the condition of the secondary (Racor) fuel filters. • Check engine fuel lines for holes or loose connections. • Check engine fuel filter and water separator for visual contamination as applicable. • Report all findings to the coxswain.
4	Coxswain report status of casualty to the Operational Commander.

Section E. Loss of Lube Oil Pressure

E.1. Symptom(s)

- Loss of engine power when throttle is increased.
- Green light extinguishes on ignition panel indicating low oil pressure.

E.2. Actions

If the engine experiences a loss of oil pressure and shuts down, take the following action:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Coxswain secure the engine if this has not already occurred.
3	Crewmembers should: • Check the outboard engine area for oil. • Verify oil level on dipstick. • Check that spin-on oil filter is tightly installed. • Check oil drain fitting for security. • Report all findings to the coxswain.
4	Coxswain report status of casualty to the Operational Commander.

Section F. Engine High Water Temperature

F.1. Symptom(s)

- Loss of engine power when throttle is increased.
- Red light (overheating indicator) illuminates on ignition control panel.

NOTE When the red overheat light illuminates, the engine speed is reduced automatically to 1800 RPM. If the condition persists another 20 seconds, the engine shuts down.

- Steam escapes from engine cover.

F.2. Actions

If the engine experiences high water temperature, take the following actions:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Coxswain bring engine to idle and stop the engine.
3	Crewmembers should: • Check engine cover with the back of the hand to ascertain any abnormal temperature. • Check around engine cover for evidence of steam. • If possible, tilt engine forward and check cooling water intake screen for obstructions. • Report all findings to the coxswain.
4	Coxswain report status of casualty to the Operational Commander.

Section G. Damage to Collar

G.1. Symptom(s)

- Obvious rips and tears to collar.

G.2. Actions

If damage to the collar occurs, take the following actions:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Crewmembers should: • Check the physical condition of the collar. • Report all findings to the coxswain.
3	Coxswain report status of casualty, disabling or restrictive, to the Operational Commander. Return home as directed by extent of casualty and direction of Operational Commander.

Section H. No Power/Insufficient Power to Communications/Navigation Equipment

H.1. Symptom(s)

- VHF, radar, GPS, or DGPS system(s) fail to operate properly.

H.2. Actions

If there is no power to operate the communications/navigation equipment, take the following actions:

Step	Action
1	Coxswain notify and direct the crew to investigate the casualty, and reports status, cause and, if applicable, estimated time to repair.
2	Verify alternator output on voltmeter for each engine.
3	Check the position on power panels of all breakers and switches for the affected equipment.
4	Crewmembers report all findings to the coxswain.
5	Coxswain report status of casualty to the Operational Commander.

Appendix A. Outfit List and Stowage Plan

Introduction

This appendix contains the standard stowage plan for Defender Class boat outfitting. No deviation from this list is authorized, except in the event that the addition of portable equipment, not part of the standard boat outfit, is necessary to meet mission needs; units are authorized to temporarily carry this extra equipment on a per sortie basis.

Defender Class boat Management Information, Configuration, and Allowances (MICA) provides national stock numbers (NSNs) and ordering information for all outfit list items.

WARNING

Any time the boat is started or has way on, the coxswain MUST have the lanyard of the engine kill switch clipped to his/her survival vest or PFD. A second kill switch activation clip and lanyard MUST be carried onboard to enable remaining crewmembers to operate the boat in the event the coxswain is ejected.

In this appendix

This appendix contains the following information:

Topic	See Page
RB-HS Outfit List and Stowage Plan	A-3
RB-S Outfit List and Stowage Plan	A-5

RB-HS Outfit List and Stowage Plan

Item	Part Number	Quantity
Anchor/Ammunition Locker		
Fortress 7- Pound Anchor	FX11	1 each
3/8" Galvanized Anchor Shackle WWL-2000 lbs.	147610	3 each
¼"x 4' PVC Coated Anchor Chain (secured w/ Bungee Cord)	3112944	1 each
Mooring Lines (1 ½" DBN x 25')	Samson 618032202561	2 each
Fenders (5 ½"x 20")	Polyform G3	2 each
Bucket		1 each
Main Cabin		
Forward Compartment (Cuddy Cabin)		
Fire Extinguisher (Type B-1)		1 each
Starboard Seats - Forward Section of Storage Compartment		
Electronics Operator Manuals	Various	1 per
Nav Kit Containing**:**		1 kit
Briefcase With CG Logo	8460-01-411-8610	1 each
Charts (as required per AOR)		various
Pencils		1 min
China Markers		1 min
Stop Watch		1 each
Search Pattern Slide Rule		1 each
Parallel Rule		1 each
Weems Plotter		1 each
Anemometer	7510-00-323-8788	1 each
Gum Eraser		1 each
Pencil Lead Sharpening Pad		1 each
Tide Book (pages as required)		various
Coast Pilot (pages as required)		various
NAVRULS		1 each
Light List (pages as required)		various
Nautical Slide Rule		1 each
Chart One	7530-00-223-7939	1 each
Note Pad		1 each
Flashlight With Red Lens		1 each
Compass and Dividers		1 each
Starboard Seats - Center Section of Storage Compartment		
EEBDs and CBR Equipment		4 each
Starboard Seats - Aft Section of Storage Compartment		
First Aid Kit	First Aid Pak MSP 50/SBP999	1 each
Hand Bilge Pump	Thirsty Mate 118PF	1 each

RB-HS Outfit List and Stowage Plan, Continued

Item	Part Number	Quantity
Port Seats - Forward Section of Storage Compartment		
Batteries (12 Volt Gel Cell)		3 each
Port Seats - Center Section of Storage Compartment		
Spare Parts kit/Tool Bag Containing		1 each
Lube Oil (10w/30)		2 Quarts
Phillips and Slotted Screwdriver		1 each
Metric Wrench Set		1 each
Pliers		1 each
Rags		Misc
Hub Kit		1 each
Spare Kill Switch Lanyard	Honda 36182-ZV4-000AH	2 each
3/16" T-Allen Wrench		1 each
90 Degree Phillips Screwdriver		1 each
Port Seats - Aft Section of Storage Compartment		
Gear Bag Containing		1 each
1 1/2" DBN Skiff hook Line 9'		1 each
1 1/2" DBN Towing Bridle 15'		1 each
SS Shackles (3/8" and 1/2")		1 each
Mousing Wire Ties		4 min.
Flashlight (No larger than 2 D cell in size)		1 each
Dewatering Pump Tie Down Strap		2 each
Binoculars		1 each
Fenders (5 ½"x 20")	Polyform G3	2 each
Mooring Lines (1 ½" DBN x 25')	Samson 6180032202561	2 each
Seat Backs or Bottom Cushions (4)		
Boat Crew Survival Vest		4 each
Aft Cabin Door		
Garelick Deluxe Telescoping Boat Hook to 8'	55170	1 each
Main Deck		
24" Throwable Life Ring	Jim Buoy GO-X-24T	1 each
Life Ring Strobe Light	ACR SM-2	1 each
National Ensign	8345-00-242-2040	1 each
CG Ensign	8345-00-242-0275	1 each
Towline 1 ½" DBN (with cover)	Samson 472032006030	150 feet
406 MHz Category II EPIRB with GPS	ACR Model 2744	1 each
Throw Line Bag (Aft of Port Deck Locker)		1 each
Port Deck Locker		
No Stowage, (Potential for Damage to Fuel System)		
Starboard Deck Locker		
Fire Extinguisher (Type B-1)		1 each

RB-S Outfit List and Stowage Plan

Item	Part Number	Quantity
Anchor/Ammunition Locker		
Fortress 7- Pound Anchor	FX11	1 each
3/8" Galvanized Anchor Shackle WWL-2000 lbs.	147610	3 each
¼"x4' PVC Coated Anchor Chain (secured w/ Bungee Cord)	3112944	1 each
Mooring Lines (1 ½" DBN x 25')	Samson 618032202561	2 each
Fenders (5 ½"x 20")	Polyform G3	2 each
Bucket		1 each
Main Cabin		
Forward Compartment (Cuddy Cabin)		
Spare Kill Switch Lanyard (stowed in Pouch)	Honda 36182-ZV4-000AH	1 each
3/16" T-Allen Wrench (stowed in Pouch)		1 each
90 Degree Phillips Screwdriver (stowed in Pouch)		1 each
Fire Extinguisher (Type B-1)		1 each
Starboard Seats - Forward Section of Storage Compartment		
Electronics Operator Manuals	Various	1 per
Nav Kit Containing:		1 kit
Briefcase With CG Logo	8460-01-411-8610	1 each
Charts (as required per AOR)		various
Pencils		1 min
China Markers		1 min
Stop Watch		1 each
Search Pattern Slide Rule		1 each
Parallel Rule		1 each
Weems Plotter		1 each
Anemometer	7510-00-323-8788	1 each
Gum Eraser		1 each
Pencil Lead Sharpening Pad		1 each
Tide Book (pages as required)		various
Coast Pilot (pages as required)		various
NAVRULS		1 each
Light List (pages as required)		various
Nautical Slide Rule		1 each
Chart One	7530-00-223-7939	1 each
Note Pad		1 each
Flashlight With Red Lens		
Compass and Dividers		1 each
Starboard Seats - Center Section of Storage Compartment		
EEBDs and CBR Equipment (if equipped)		4 each
Starboard Seats - Aft Section of Storage Compartment		
First Aid Kit	First Aid Pak MSP 50/SBP999	1 each
Hand Bilge Pump	Thirsty Mate 118PF	1 each

RB-S Outfit List and Stowage Plan, Continued

Item	Part Number	Quantity
Starboard Bulkhead Outboard Coxswain Chair		
Binoculars		1 each
Port Seats - Forward Section of Storage Compartment		
Batteries (12 Volt Gel Cell)		3 each
Port Seats - Center Section of Storage Compartment		
Spare Parts kit/Tool Bag Containing Lube Oil 10w/30 Phillips and Slotted Screwdriver Metric Wrench Set Pliers Rags Hub Kit		1 each 2 Quarts 1 each 1 each 1 each Misc 1 each
Port Seats - Aft Section of Storage Compartment		
Gear Bag Containing 1 1/2" DBN Skiff hook Line 9' 1 1/2" DBN Towing Bridle 15' SS Shackles (3/8" and 1/2") Mousing Wire Ties Flashlight (No larger than 2 D cell in size) Dewatering Pump Tie Down Strap		 1 each 1 each 1 each 4 min. 1 each 2 each
Fenders (5 ½"x 20")	Polyform G3	2 each
Mooring Lines (1 ½" DBN x 25')	Samson 618032202561	2 each
Seat Backs or Bottom Cushions (4)		
Boat Crew Survival Vest		4 each
Main Cabin Above Aft Cabin Door		
Towing Mast		1 each
Lightning Rod		1 each
Aft Cabin Door		
Garelick Deluxe Telescoping Boat Hook to 8'	55170	1 each
Main Deck		
24" Throwable Life Ring	Jim Buoy GO-X-24T	1 each
Life Ring Strobe Light	ACR SM-2	1 each
National Ensign	8345-00-242-2040	1 each
CG Ensign	8345-00-242-0275	1 each
Towline 1 ½" DBN (with cover)	Samson 472032006030	300 feet
406 MHz Category II EPIRB with GPS	ACR Model 2744	1 each
Throw Line Bag (Aft of Port Deck Locker)		1 each
Port Deck Locker		
No Stowage, (Potential for Damage to Fuel System)		
Starboard Deck Locker		
Fire Extinguisher (Type B-1)		1 each

Appendix B. Engineering Changes

Introduction This appendix contains a list of authorized engineering changes (EC) for Defender Class boats.

NOTE For a complete breakdown of the Engineering Change Request, see the *Naval Engineering Manual,* COMDTINST M9000.6 (series), *Chapter 41*.

In this appendix This appendix contains the following information:

Topic	See Page
Engineering Changes (ECs)	B-3

Engineering Changes (ECs)

EC Number	Subject	Date

Appendix C. Material Inspection Checklist

Introduction

This appendix is meant to be a systematic means to inspect ANY Defender Class boat and to ensure the entire boat is prepared to meet mission demands.

This checklist may be locally reproduced.

In this appendix

This appendix contains the following information:

No.	Area	See Page
I	Hull	C-5
II	Deck	C-7
III	Bilge	C-9
IV	Aft Port and Starboard Storage Lockers	C-11
V	Outboard Engines and Steering Actuator	C-13
VI	Cabin (Interior)	C-15

Material Inspection Checklist

Boat Number: _____

Station: _____

Date: _____

References:

- *Defender Class Operator's Handbook*, COMDTINST M16114.37 (series)
- *Naval Engineering Manual*, COMDTINST M9000.6 (series)
- *Coatings and Color Manual*, COMDTINST M10360.3 (series)
- *Coast Guard Rescue and Survival Systems Manual*, COMDTINST M10470.10 (series)

WARNING

The engine kill switch lanyard and activation clip MUST be inspected daily. Damaged, deteriorated or frayed lanyards must be replaced prior to engine start. Engine kill switch operation must be tested weekly.

Inspection Standards:

The following inspection standards apply to Defender Class boat hull, machinery, equipment, outfit, and all installed systems and accessories:

- Operates smoothly and correctly.
- Free of grease, oil, rust, and corrosion.
- All fluid levels and pressure readings are within tolerances.
- Protective coatings applied correctly and neatly.
- Free of rips, tears, abrasions, and cracks.
- Outfit and equipment correctly installed, adjusted, and stowed to specifications and design (see *Appendix A*).
- Labels, test dates, and placards properly displayed.
- Free of non-standard/unapproved installations or equipment.
- Maintained according to current manufacturer's guidelines and Commandant Directives.

Inspection Guidelines:

Inspections require a minimum of ***two*** experienced personnel, preferably one Boatswain's Mate and one Machinery Technician, who have a strong working knowledge of the contents of all references listed above. Each item on the checklist should be judged against applicable standards and references. Additional discrepancies, uninstalled engineering changes (ECs), etc. should be listed.

Inspected By: _____ **Date:** _____

Inspected By: _____ **Date:** _____

I. Hull

WARNING

Any time the boat is started or is underway, the coxswain MUST have the lanyard of the engine kill switch clipped to his/her survival vest or PFD. A second engine kill switch activation clip and lanyard MUST be carried onboard to enable remaining crewmembers to operate the boat in the event the coxswain is ejected.

ITEM	SAT	UNSAT	REMARKS
Hull (Visible Surfaces)			
Collar			
Transom			
Depth Sounder Transducer Wiring			
Tie-Downs			
Outboard Engines			
Steering Actuator			
Zinc Anodes			
Lettering/Numbering/Decals			
Waterline			
Self-Bailing One-Way Scuppers			
Navigation Lights (Red/Green)			

REMARKS:_____

_____

_____

II. Deck

ITEM	SAT	UNSAT	REMARKS
Radar Pod Fittings and Hinge			
Lifting Eyes and Tie-Downs			
Heater Fuel Fill Station (RB-HS Only)			
Deck Covering (Non-Skid)			
Heater Exhaust			
Heater Intake			
Forward Tow Bitt			
Aft Tow Bitt			
Gun Mounts (if installed)			
Ammunition Locker Shelves			
Anchor Locker			
EPIRB			
VHF Antennas			
Radar Pod			
Horn			
Radar Antenna			
GPS Antenna			
Blue Strobe Lights			
Loudhailer Speaker			
Floodlights			
Anchor Light			

ITEM	SAT	UNSAT	REMARKS
Towlight Mast (If Installed)			
Searchlight			
Cabin (Exterior)			
Cabin Door			
Windshield			
Side Windows and Doors			
Windshield Wipers			
Cuddy Cabin Door			
Electric Cabin Dewatering Pump Overboard Discharge			
Battery Vent(s)			

REMARKS:_____

III. Bilge

ITEM	SAT	UNSAT	REMARKS
Electric Cabin Dewatering Pump (Inside cabin, aft starboard corner seat box (RB-S). Inside cabin, centerline under aft cabin step (RB-HS).)			

REMARKS:_____

IV. Aft Port and Starboard Storage Lockers

ITEM	SAT	UNSAT	REMARKS
12-VDC Bus Bar			
Primer Bulbs			
Fuel Tank Level Sensor			
Fuel Filters (Racor)			
Fuel Fill Cap			
Fuel Fill Line			
Fuel Vent(s)			
Lift Fixtures			
Scuppers			
Heater Fuel Tank Fill Cap (RB-S Only)			
Heater In-Line Fuel Filter			
Portable Fire Extinguisher			

REMARKS:_____

V. Outboard Engines and Steering Actuator

ITEM	SAT	UNSAT	REMARKS
Engine			
Engine Cover			
Oil Dipstick			
Oil Fill Cap			
Propeller			
Engine Attachment Points			
Cooling Water Flow Indicator			
Cooling Water Intakes			
Zinc Anodes			
Belts			
Hoses			
Water Separator Bowl			
Wiring			
Control Cables and Linkage			
Steering Actuator			
Actuator Shaft (Exposed Area)			
Cylinder			
Attaching Hardware			
Tie Bar			

ITEM	SAT	UNSAT	REMARKS
Hydraulic Lines and Fittings			

REMARKS:_____

VI. Cabin (Interior)

ITEM	SAT	UNSAT	REMARKS
Crew Seats			
Battery Switches			
Batteries and Battery Box			
Ignition Panels (Start Keys, Engine Kill Switch Clips, and Lanyards)			
Communications/Navigation Equipment			
VHF Radios			
Radar			
Depth Sounders			
Microphones			
Engine Throttle Control			
Steering Wheel			
Helm Pump			
Power Panels and Switches			
Heater Control			
Searchlight Control			
Engine Gauges and Warning Lights			
Long Arms Stowage			
Fans			
Interior Lights			

ITEM	SAT	UNSAT	REMARKS
Windshield Wipers and Washer Controls			
Sliding Windows and Latches			
Portable Fire Extinguisher			
Towlight Mast (If Stowed)			

REMARKS:_____

Appendix D. Disabling Casualties

Introduction

This appendix contains disabling casualties for Defender Class boats. Refer to *Chapter 5.A* of this handbook for steps to follow if any of these casualties occur.

In this appendix

This appendix contains the following information:

Topic	See Page
Engine Parameters	D-3
Engineering System Components	D-3
Electronics/Navigation	D-3
Safety	D-4
General Material	D-4

Disabling Casualty List

Engine Parameters	• Engine Lube Oil Pressure:
	  ▪ Green Engine Oil Pressure Light extinguishes on ignition panel, engine RPM is automatically limited to 1800 RPM.
	• Engine Cooling Water:
	  ▪ Red overheating indicator illuminates on the ignition panel, or audible alarm sounds, engine speed is automatically reduced to 1800 RPM. If condition continues for another 20 seconds, the engine automatically shuts down.

Engineering System Components	• Engine fails to start. • Uncontrollable overheating. • Inoperative visual or audible alarms • Metallic/non-metallic noise: metal-on-metal/fuel-knock/bearing/clicking. • Excessive engine vibration. • Any fuel (gasoline) system or engine component leaking or dripping fuel. • Engine surging (over 50 RPM) • Engine over speed (over 6000 RPM). • Loss of engine control. • Continuous electrical breaker trip. • Continuous failure of outboard engine fuses. • Steering system inoperative. • Engine mount hardware loose or missing. • Loose/missing propeller coupling nut. • Loose/disconnected engine control hardware. • Loose/disconnected steering actuator hardware.
Electronics/ Navigation	• No electronic means of signaling distress (i.e., no radio, EPIRB not installed or unserviceable, etc.). • 12-Volt system will not energize.

Safety	• Truck and complete hitch system not rated to 10,000 lbs minimum, rating must be marked by stencil/sticker/stamp. • Electrical arcing and sparking. • Odor of insulation overheating. • No portable fire extinguishers (unserviceable). • No spare engine kill switch activation clip and lanyard available. • Radar pod securing hardware loose/missing.
General Material	• Hull breach below the waterline. • Crack in transom plate.

Appendix E. Restrictive and Major Discrepancies

Introduction This appendix contains restrictive and major discrepancies for Defender Class boats. Refer to *Chapter 5* of this handbook for steps to follow if any of these casualties occur.

In this appendix This appendix contains the following information:

Topic	See Page
Restrictive Discrepancies	E-3
Major Discrepancies	E-5

Restrictive Discrepancies

Engine and Boat Systems	• Engine performance: Minimum RPM of 4400 for two minutes. • Any Leaks ▪ Outboard cooling water components. ▪ Outboard engine lubrication system components. ▪ Steering actuator helm pump, hoses or fittings. ▪ Diesel fuel.
Engineering System Components	• Electric cabin dewatering pump is inoperative.
Electronics/ Navigation	• Navigation lights inoperative or displaying improper characteristics. • Depth sounder inoperative. • GPS inoperative. • Radar inoperative. • Magnetic compass affected as described below: ▪ Deviation table missing. ▪ Compass deviation greater than 5 degrees. • Unable to calibrate electronic Compass. • Electronics: ▪ One VHF transceiver inoperative.

General Material and Safety	• Watertight integrity:
	  ▪ Holes/cracks in the hull above the waterline.
	  ▪ Damage to collar that removes the polyurethane coating or exposes interior foam.
	• Personal survival vest missing or unserviceable (4 on board).
	• One portable fire extinguisher missing or unserviceable.

Trailer	• Missing or flat, improper size, damaged, or worn tire(s). • Trailer running lights inoperative or wrong characteristic. • Brake actuator or back up solenoid inoperative or no fluid. • Wheel bearings or brakes have excessive noise or play. • Structural cracks. • Missing safety chains or brake emergency chain. • Emergency brake latch fails to operate. • Missing tie down straps. (6 required/not including winch strap)

Major Discrepancies

Engine and Boat Systems	• Electric cabin dewatering pump hose missing hose clamps. • Loose/missing fittings, nuts, bolts, brackets, etc. • Loose/missing hardware on the engines used for attaching accessories and sensors. • Battery terminals loose or corroded. • Engine control cables loose. • Fluid levels below minimum required. • Charging system faulty or inoperative. • Any standard boat machinery, with the exception of those listed on the disabling or restrictive list, not operating properly.
Boat Outfit	• Life ring and/or distress light (missing/unserviceable). • Missing seat belts.
Electronics/ Navigation	• Compass light inoperative. • Expired deviation table. • Any standard boat electronics, with the exception of those listed on the restrictive list, not operating properly.
General Material and Safety	• Watertight integrity. • Improperly repaired, altered, or damaged hull or collar. • Damage to folding radar pod. • Any standard boat machinery or system, with the exception of those listed on the disabling or restrictive lists, not operating properly.
Trailer	• Loose, missing or improper hardware. • Brake fluid level low. • Nonstandard type tie-down straps.

Appendix F. List of Acronyms

Introduction This appendix contains a list of acronyms used throughout the handbook.

In this appendix This appendix contains the following information:

Topic	See Page
List of Acronyms	F-3

ACRONYM	DEFINITION
AC	Aircraft
ATF	Automatic Transmission Fluid
BCRB	Bow Collar Reinforcement Bracket
CASREP	Casualty Report
CO	Commanding Officer
COLREGS	Collision Regulations
DBN	Double-Braided Nylon
DES	Digital Encryption Standard
DGPS	Differential Global Positioning System
DIW	Dead-in-the-Water
DO	Defense Operations
DSC	Digital Selective Calling
EC	Engineering Change
ECM	Engine Control Module
ELC	Engineering Logistics Center
ELT	Enforcement of Laws and Treaties
EMI	Electro-Magnetic Interference
EPIRB	Emergency Position Indicating Radio Beacon
GPH	Gallons Per Hour
GPS	Global Positioning System
HPA	Helm Pump Assembly
LED	Light Emitting Diode
MARPA	Mini Automatic Radar Plotting Aid
MEP	Marine Environmental Protection
MICA	Management Information, Configuration, and Allowances
MIG	Metal Inert Gas
MOB	Man Overboard
MSO	Marine Safety Office
MSS	Marine Safety and Security

ACRONYM	DEFINITION
MSST	Marine Safety and Security Team
NM	Nautical Mile
NSN	National Stock Number
OHIP	Overhead Hinged Instrument Panel
OIC	Officer-in-Charge
PFD	Personal Flotation Device
PGM-FI	Programmed Fuel Injection
PMS	Preventive Maintenance System
PPE	Personal Protective Equipment
PSS	Port Safety and Security
RB-HS	Response Boat – Homeland Security
RB-S	Response Boat – Small
RBS	Recreational Boating Safety
RFO	Ready for Operation
SAFE	Secured Around Flotation Equipped
SAR	Search and Rescue
SINS	Scalable Integrated Navigation System
SOP	Standard Operating Procedure
TIG	Tungsten Inert Gas
UHMW	Ultra High Molecular Weight
UV	Ultraviolet
VDC	Volts Direct Current
WAAS	Wide Area Augmentation System
XO	Executive Officer
XPO	Executive Petty Officer
XTE	Cross Track Error

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